# Information Technology and Urban Governance

Ministry of State
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Canada

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Canada

# Information Technology and Urban Governance

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Edited by
Barry S. Wellar

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## Foreword

I am most pleased that the Ministry of State for Urban Affairs is publishing a Proceedings from the Symposium on Information Technology and Urban Governance. For a variety of reasons, not all persons and agencies could attend the Symposium. Hence, this document serves as a means of communicating the presentations to a wider, interested audience.

One of the acknowledged accomplishments of the Symposium, and of this publication, is that a variety of urban topics, and a number of functions within government have been brought together for consideration. Further, and possibly even more important, representatives of all levels of government from many jurisdictions, and the private and university sectors joined in the debate with a common sense of purpose: to seek ways and means to an improved quality of urban life.

While it would be premature to suggest that consensus was reached in even a few instances, it is wholly appropriate to observe that we have not only attained better understandings of what is and what might be, but of how to get there as well. I am hopeful that the Proceedings, as both a document of substance and a source for identifying people and places of accomplishment, will help us more readily attain our preferred urban and larger societal objectives.

I wish to commend the authors of papers for their contributions, and to thank their agencies for encouraging them to participate in this Ministry effort.

Hon. Barney Danson
Ministry of State for
Urban Affairs
Canada

## Preface

The significance of the Proceedings is eloquently captured in the individual papers, and it would be gratuitous on my part to attempt to provide a raison d'être for the Symposium or the Proceedings. There are, however, several items of context which the reader should bear in mind while examining the papers:

1 Speakers/writers were assigned their topics. This means that there are few if any "canned" presentations or articles. It also means, concomitantly, that this is the first airing of some of the points of view. Hence, while there is a freshness to the ideas put forth, there is also a firstness. Clearly, we have initiated rather than completed a body of dialogue.

2 Speakers/writers represent departments and agencies in different governments (federal, provincial, regional, municipal), universities, and private firms. These persons, and their institutions, have attained different levels of sophistication vis-à-vis information technology and urban governance. It was intended that the Symposium be somewhat representative, and that we not hear only from the biggest and best. We were not as successful as one might have hoped in terms of getting a look at the full spectrum, but a solid start has been made in this regard.

3 The Symposium originally had a "local level" orientation in terms of government function (management, operations, planning) perspectives about their respective roles in the evolution of information technology (Track Sessions). When it became apparent, however, that the generic aspects of the relationships were very much in need of discussion, that structure was relaxed. Hence, some papers place the perspectives in a local government context, and others do not. As can be seen from reading the papers, however, all papers contain pertinent comments for agencies in general, and some contain an extra dimension, that is, local level considerations.

4 Due to postal service problems before the Symposium, speakers/writers performed under a severe time constraint. While it may be true that authors often put off preparing presentations until the eleventh hour, usually they have had several months or more to mull over what it is that they might say. In this instance they did not have the luxury of a lengthy prep time, and they could not pull their papers off the shelf. This prefatory comment should in no way be construed as offering an excuse for the authors, but merely to acknowledge the difficult

circumstances imposed upon them by the Symposium organizer.

5 While several of the rapporteurs were named before the Symposium, others volunteered for the task during the Symposium. Furthermore, rapporteurs operated without a uniform set of guidelines. These individuals, therefore, warrant our full appreciation for their efforts at pulling together what were, at times, very divergent arguments.

In addition to the Proceedings, there are three other Symposium-related papers: "Impressions on the Status of Computer-Assisted Information Systems in Urban Governance" by B. Wellar; "A Canadian Bibliography of Urban and Regional System Activity" by K. Lauder and L. Lavallée and "Bibliography on Canadian Land Market Mechanisms and Land Market Information Systems" by R. Lambert and L. Lavallée. These documents were prepared to serve as frames of reference for Symposium discussions, and as substantive contributions to on-going efforts to exploit information technology as a means towards an improved quality of life in (urban) Canada.

Since the success of a meeting of this type depends almost entirely on voluntary contributions, it is most appropriate to thank speakers, rapporteurs, and chairpersons. We are particularly indebted to those who prepared papers for the Proceedings. Approximately 70% of Symposium attendees played an active role which, to my mind, accounts for the following: there was an acknowledged awareness throughout the Symposium that there are more learning than learned persons in this area of concern, and that if we do not help each other no one else will. It is my hope that readers will contribute their fair share towards productive outcomes in this field by communicating their findings on how what is contained on these pages helped or hindered their own efforts.

Finally, it is my pleasure to acknowledge the efforts of Ministry staff during the entire Symposium process. On behalf of all who benefit from the endeavour, thanks are due to Communications Branch personnel (George Raley, Claude Gendron, Vivian Astroff, Francine Dalphond, Gilles Gratton, and Director Ken Kelly), and to Maurice Couillard, Dee Bois and Claude Brazeau for their administrative support.

Typing of this document was done by Lynne Fullerton, and John Sheridan took on the task of setting up, checking, and proofing papers. Given the variations in style of contributing authors, including their more than occasional disregard for headings, dropped brackets, missing reference numbers, flights to jargon, etc., Lynne and John performed admirably. Appreciation of their contributions toward

making a collection of papers a Proceedings is hereby expressed.

A singular, special debt of gratitude is owed to Mrs. Francine Roy who organized meetings and offices, typed letters and papers, handled finances and arrangements, and made countless telephone calls. That she could perform all those tasks is testimony to her abilities; that she performed them in continuing good spirit underlines our collective indebtedness.

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Ottawa, Canada

Opening Address

## Information Technology and Urban Governance: Problems and Prospects

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### Abstract

This paper overviews a series of problems and prospects associated with the themes of the Symposium. The first set of talking points deals with topics of the Plenary Sessions: Impacts (Institutional, Community, Individual), Applications (Finance, Property, Legislation Processing) and Intergovernmental Concerns (Transfer of Technology and Lessons Learned, Joint Participation, and Evaluation). The second set of talking points relate to topics of the Track Sessions: the roles and responsibilities of different functions in terms of the evolution of an information technology capability in an institution. The paper provides an overview of the Symposium, introduces a number of items to be borne in mind during the Sessions, and provides a background against which participants may assess the structure and content of the Symposium.

### Résumé

Ce document présente brièvement un ensemble de problèmes et de perspectives reliés aux thèmes du Symposium. Le premier groupe de sujets de discussion porte sur les thèmes des séances plénières, soit: les effets de l'informatique (sur les institutions, sur la communauté et sur l'individu), ses applications (dans les domaines des finances, de la propriété et de la rédaction des lois) et les préoccupations intergouvernementales (en ce qui a trait aux échanges technologiques, aux enseignements, à la participation mixte et à l'évaluation). Le deuxième groupe réunit les questions abordées dans les ateliers thématiques, soit les rôles et les responsabilités qui se rattachent aux différents services en ce qui concerne l'évolution de la technique informatique au sein d'une institution. Ce document donne une idée d'ensemble du Symposium, introduit un bon nombre de points dont il faudra tenir compte au cours des séances et des ateliers thématiques, et constitue un document de base qui permettra aux participants d'évaluer la structure et le contenu du Symposium.

## Introduction

In order to place the Symposium in its larger context it is appropriate to dwell briefly upon the objectives around which the Symposium was structured:

Objective 1 To ascertain and subject to critical debate philosophies and methodologies underlying the evolution of information technology as a component of urban governance.

The growing pervasiveness of information technology in all levels of government, and matters related to benefit/cost relationships, changes in delivered goods and services etc., point to a critically useful Symposium function: to inventory and analyse attitudes, perceptions, and procedures which underlie conceptualization, design, development, and implementation of information technology as a tool of institutions in general, and of local governments in particular.[1]

Objective 2 Establish a nationally-based appreciation of the nature and extent of information technology applications in urban governance in Canada.

In very few countries have detailed, representative, empirical studies been carried out to determine the status of information technology applications in local government.[2] As a result, there is a limited factual basis upon which to either establish support programs at the national level, or to take advantage of what has already been accomplished when initiating an application at the local level. Both of the above situations would best be served by widespread appreciation of numerous applications at a point in time. The present Symposium deals with three selected applications as important topics per se, but also as a test case towards carrying out a wider investigation and assessment of the state of the art at some future date.

Objective 3 Provide a variety of contexts (social, political, geographic, economic) for evaluating the role of information technology in urban governance, with a particular view towards identifying alternative policy, program, project, and educational thrusts in this field.

Full, national appreciation of any information technology (I.T.) application remains to be achieved. The same assessment holds in terms of assembling a representative body of opinion, and fact, on how to go about evaluating the appropriate positions,

present and future, of information technology as a component of urban governance. The present Symposium was intended to serve as a collecting bed for assembling a variety of viewpoints. These would then serve as bases for actions associated with policy, program, project and educational thrusts by the public, private, and university sectors.

**Problems and Prospects: Some Talking Points**

During the course of examining a number of professional journals, working documents of government (federal, provincial, municipal) agencies, making on-site investigations, and carrying out a variety of research projects, several themes kept recurring insofar as crucial topics in this field are concerned. First, there is the matter of impacts as they relate to (a) institutions which incorporate information technology, (b) the larger communities which are served by those institutions, and (c) the individual, as a member of the institutions or communities. Second, there is the matter of the purposes, ways, and extent that information technology is being used in the performance of the nuts and bolts activities (applications) of urban governance. Third, there are myriad questions of intergovernmental or interinstitutional concern, such as transferring technologies and lessons learned, joint R & D ventures, and the universal question of how to evaluate interventions. These three bodies of issues became the foci for the Symposium's Plenary Sessions.

A second dimension which cuts across all of the above concerns, and which is intrinsic to the more general question of governance, also made itself visible to the extent that it warranted full examination during the Symposium. That is, in any local government there are basically three functions: management, planning, and operations.[3] The question asked at the Symposium was "What are the roles of these functions in the evolution of information technology?" While the question was focussed at the local level, the issue is sufficiently common to all levels of government, as well as the private sector, that viewpoints were solicited from all perspectives. The presentations dealing with the roles of the functions of management, planning, operations, and data processing, then, constituted the Track Sessions of the Symposium.[4]

The following "talking points" were presented during the opening session of

the Symposium. They were offered without consultation with the Symposium speakers, and were intended to explain in part the reasoning behind the selection of topics for consideration during the course of the Symposium.

**Talking Point 1 Impact - Institutional**

Problem: Information technology is present in virtually every city and regional government in Canada, and is integral to the performance of all those institutions. While costs for information technology per se may be in the order of $.50 to $2.00 to $6.00 or $8.00 per capita, many times those amounts are being expended through I.T. as a medium (tool) for delivering goods and services. In spite of the apparent significance of the technology to urban governance, however, far too few institutions have even begun to fully determine the nature and extent of information technology impacts on the performance of those institutions.

Prospect: That the municipal information systems R & D project at Wichita Falls, Texas, begun in 1970, supported financially by the U.S. federal government, provided with consulting firm and university-based expertise during the project, and subjected to scrutiny from a number of perspectives and by a variety of agencies, can provide meaningful insights in this regard.

**Talking Point 2 Impact - Community**

Problem: There are, presumably, information technology-induced changes in the bundle of goods and services delivered by local government institutions to their communities. Frequently, and unfortunately, the extent and utility of these changes per unit cost are not subjected to rigorous inventory and analysis. Hence, little is known, explicitly, about the social, economic, cultural and political consequences of bringing I.T. into play as a means of modifying the delivery of goods and services to the community.

Prospect: That the City of Calgary, with a strong commitment to monitoring City performance, and possibly further stimulated through participation in the information technology and urban management project of OECD, can provide a strong inductive basis for considering I.T. impacts on the public at large, community

groups, the business community, and other special interest groups.

**Talking Point 3 Impact - Individual**

Problem: In spite of the combination of information technology pervasiveness, and a seeming depersonalization process in the work place and the larger society, far too few studies or preventive/corrective programs ever start with or reach out to the individual as the focal point of concern.

Prospect: That by explicitly recognizing the individual, a community member and an employee of institutions, as being impacted by information technology, the Symposium can promote the status of this dimension vis-à-vis the other impact dimensions (institution, community).

**Talking Point 4 Application - Financial**

Problem: Newspapers, television programs, radio talk shows, and other media make it clear that Canadian society is not enthusiastic about the quality and quantity of public sector goods and services being produced per dollar spent.

Prospect: That computer-based financial information systems will promote improved performance with respect to that part of the problem associated with program budgeting, investment programming, short term cash management, funding priority analysis, and objective and goal definition.

The significance of this item is underscored when it is appreciated, for example, that a) a city may have $50 million in its short term cash flow, and can draw from nothing to 8 or 10% on that money; b) a municipality may expend something in the order of $100 to $400 or $600 per year per citizen on capital and operating expenses, and c) if monies to be used in the future for capital expenditures are not obtained in advance of their use, the cost of borrowing may increase dramatically, e.g., 30 to 50% or more in a period of 10 years.

**Talking Point 5 Application - Land Registration**

Problem: Owners, buyers and sellers of property, as well as government agencies responsible for property assessment and taxation, expend large amounts of time and money to obtain and maintain property data which are timely, reliable, and complete. The magnitude of this problem is made clear when it is realized that if there are 70,000 properties in a county, or a million of them in a province, some 25% or more of them may undergo a transaction in a given year.

Prospect: That computer-based property and land registration information systems will contribute to better assessment, taxation, planning and servicing practices, reduced legal fees, and to peace of mind on the part of persons engaging in property transactions.

**Talking Point 6 Application - Legislation Processing**

Problem: Government legislation (acts, statutes, by-laws, etc.) already on the books, being modified, or being readied for introduction is so voluminous that often only the most persevering (and perverse) citizen, politician, civil servant or vested interest can suffer to pay anything more than passing interest to items of even special concern.

Prospect: That computer-based legislation processing information systems will be able to sort and sift through the outpourings of our institutions and assemble by-laws, articles, sections, etc., which really matter, in ways which mean something to the user, including the citizen.

**Talking Point 7 Intergovernmental Concern - Transfer of Technology and Lessons Learned**

Problem: While transfers of R & D technologies and lessons learned are occurring, and the extreme points of "Do your own thing - costs be damned" and "Follow the leader - he must know what he's doing" are being studiously avoided, we are in a very weak position to meaningfully comment on costs/benefits, or ways and means to best effect these transfers.

Prospect: That we can gain an improved appreciation of issues, strategies, and likely outcomes by an examination of empirical work done in this field.

**Talking Point 8 Intergovernmental Concern - Joint Participation**

Problem: Institutional arrangements, funds, tradition, and other factors occasionally inhibit or preclude even those activities which are accepted as beneficial to all participants, with the result that a number of opportunities may be lost to both potential participants and the society at large.

Prospect: That we learn from empirical evidence already assembled, and that the cost/benefit relationship for joint participation will be sufficiently sharp to lead to programmatic follow-up if that is what the facts point to.

**Talking Point 9 Intergovernmental Concern - Results Appreciation**

Problem: Interventions are instituted to effect change in a state of affairs, occasionally without full knowledge of the existing state of affairs, often without firm ideas of what the preferred state should look like, and, likely as not mixed notions about how to relate the different states.

Prospect: That if we better understand the raison d'être of measurement and evaluation, methodologies of these processes, and interpretive peaks and pitfalls of M and E processes, then we might get a better fix of the what, why, and how of interventions, planned or underway.

**Talking Point 10 Evolution of Information on Technology - Perspectives by and about the Functions of Urban Governance**

Problem: In every institution which now has or is developing an information technology, there are repeated debates about whether those directly responsible for the technology should play a lead or service role in terms of the kind and timing of work done, the characteristics of the technology, priorities, forward planning, constituents for outputs, etc.

Although this technology is not new, and the nature of the debate is by no means new to governments (or private sector institutions), it appears fair to say that the quality of debate in many institutions is not sufficient to lead to resolution of more than a small portion of the outstanding points of difference, whether they relate to hardware, software of the data/information component of the technology. A major source of difficulty, it is suggested, is directly attributable to the factor of communication. That is, while each function may be aware of its particular positions and needs, it has a weak perception of the positions and needs of the other functions.

Prospect: That by organizing a series of sessions whereby the functions of management, planning, operations, and data processing present views on their own roles and on the perceived roles of the other functions as well, we may more rapidly close the gap between what should be and what is with respect to the I.T. capability in an institution. It is anticipated therefore, that by furthering discussion towards a better appreciation of expectations associated with each of the functions, the parts, we will promote better performance by the entire institution, the whole.

## Conclusion

This paper presents in the form of "talking points", the bases upon which the Symposium was organized. The talking points cover a range of items related to the more effective and efficient use of information technology as an instrument of urban governance. Further, the importance of being aware of roles, self-proclaimed and otherwise, associated with the functions of management, planning, operations, and data processing (for information technology) is emphasized.

## Notes and References

1 "Information technology" is used broadly here to include computer hardware and software, telecommunications, remote sensing devices, and management science and systems analysis techniques, i.e., instruments and ways and means used to specify, acquire, process, disseminate and use (apply) data and/or information in conjunction with such functions and activities as, for example, management, planning, operations, etc., in the public, private, university, etc. sectors.

2 In Canada, there are a limited number of documents which treat this topic. See, for example, M. Barcelo, H.C. Campbell, and D.A. Young, Information for Urban Affairs in Canada (Ottawa: Canadian Council on Urban and Regional Research, 1971); A. Hughes, Data Base and Information System Research and Development in Canada: Problems and Roles (Ottawa: Ministry of State for Urban Affairs, 1973). For an assessment of cities in the United States, see Municipal Information Systems: The State of the Art in 1970 (Washington, D.C.: U.S. Government Printing Office, 1971). For details on a study of international dimensions, now underway and involving 16 cities in 9 countries, contact Computer Utilization Group, Directorate for Science, Technology and Industry, Organization for Economic Cooperation and Development, Paris, France.

3 As used here, management represents the activities of setting priorities, defining goals, allocating resources, etc. for the planning and operations functions; planning represents physical and social planning in the sense of comprehensively linking management and planning outputs with operations outputs in a manner which renders them all compatible over time and space; and operations represent such line agencies as engineering, finance, transportation, personnel, utilities, assessment, policy, fire, etc.

4 "Data processing" as used here also refers to "management systems", "organization and methods", "data systems" or any other term used to denote the agency responsible for the running of the information technology capability.

## Urban Management in New York and Elsewhere - A Commentary

E.S. Savas
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Columbia University, New York, and formerly
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Cities are not immune from the problems afflicting New York; New York's problems are merely more visible and better reported. New York is performing an international service as a leading indicator of urban problems, and other cities have now been forewarned.

At the simplest level, New York's problem is a budget gap, a gap between revenues and expenditures. Expenditures rose because of increased demand for services, stimulated in part by federal programs and in part by a large-scale influx of low-income, service-consuming in-migrants, and because of the increased cost of providing each unit of service. Revenues declined, relative to expenditures, because the middle class has been moving out, aided by federal programs which accentuated the problem.

A city must be treated as an entity. But political leaders tend to look at a city narrowly, as groups of voters to be satisfied in the short-run. Many managers in city government also tend to look at a city narrowly, as an organiztion to be administered. We must look at a city as an economic unit that uses its residents to produce goods and services and, in exchange, provides its residents with a satisfactory quality of life.

We must sort out our public services and decide which level of government should provide services to whom, and how they should be paid for. Regionalization, neighbourhood government, and revenue sharing are all involved in this issue. On the subject of regionalism, it is worth noting that the western boundary of New York City, the Hudson River, was established by the Duke of York, in London, in 1664. While that boundary may have made a great deal of sense then, it is hopelessly obsolete today, but it remains, an anachronistic noose strangling New York by cutting off its support from its middle class across the river.

But New York's greatest need, its best hope, its most important lesson for other cities, and its greatest challenge is to introduce effective management methods into all levels of city government. Too many city agencies are overstaffed, overpaid, and underproductive. We need better information systems to measure how well we are doing, and greater determination to make the changes that are called for.

In New York, some of the fault lies with legally mandated civil service procedures that, while once progressive, are now moribund and counterproductive. The merit system has been perverted into a seniority system that excludes qualified outsiders. Most promotions are based entirely on unvalidated written examinations, while performance on the job receives no weight whatsoever, a procedure which demoralizes thousands of good workers who are poor test-takers. Traditional methods for filling middle and upper echelon jobs in the city will have to yield to new approaches that will attract and produce capable, motivated and sensitive managers who can repair the city's defective administrative apparatus and who can function well in public service.

Taxpayers will no longer tolerate having three employees do the work of one, or paying $10 an hour for a job that's worth $2.50 an hour. But most of the proposals for reducing personnel expenditures are opposed vigorously by the municipal unions. Indeed, New York's greatest management problem stems in large measure from the fact that the monopoly services that have traditionally been provided by public employees here have been captured by employee unions that are using that monopoly power for private gains that are antithetical to the public interest. Otherwise responsible union leaders are inexorably forced to take advantage of the power that is thrust into their hands, and to wield it for selfish rather than civic ends.

The only lasting defense against municipal labor monopolies is competition. Refuse collection, street repair, park maintenance, and many other (but certainly not all) functions can be partially contracted out to the private sector under conditions which encourage true competition. A recent, major study in the U.S. showed that in cities larger than 50,000 population, refuse collection by private firms under contract to the city was substantially less costly to the cities than collection by a municipal agency.

To repeat, these problems are not unique to New York. Therefore, do not seek to know for whom the bell tolls; it tolls for thee.

## Institutional Impacts of Introducing Information Technology at the Local Level

Gerald G. Fox
City Manager,
City of Wichita Falls, Texas

### Abstract

Information technology at the local government level holds great promise for improving the governance of cities. Introducing information technology in local governments will affect that institution both positively and negatively. Impacts will result from the organization created for the implementation of information technology; from privacy and security considerations. These impacts will affect the organizational structure of the institution; and will impact the goals, priorities and levels of expectation within the organization. Institutional impacts from information technology will affect employees, departmental managers and supervisors, information technicians, departmental operations, decision making and citizens. There will be adverse impacts and problems with such a technological effort, but I would have to conclude that the ultimate implementation of information technology in our cities will produce substantial long-range benefits.

### Résumé

L'utilisation de l'informatique au palier local constituera un grand apport à l'amélioration de l'administration municipale. Toutefois, l'introduction de l'informatique au sein de ces administrations n'aura pas que des effets positifs sur les institutions administratives. A cause des nouvelles structures qu'il faudra créer pour appliquer ces techniques, et pour des raisons de sécurité et de discrétion, la structure de l'administration, ses objectifs, ses priorités et ses niveaux de rendement seront modifiés. Ces modifications toucheront en outre les employés, les directeurs et les surveillants des différents services, les activités de ceux-ci, les techniciens en informatique, le processus décisionnel et les citoyens. Un tel effort technologique entraînera des problèmes et des effets indésirables, mais je dois toutefois conclure que l'application définitive de l'informatique dans nos villes comportera, à long terme, des avantages considérables.

## Introduction

To place us all in a common perspective, let me begin this symposium on information technology in local government with my view, as a local government chief executive, of the needs and benefits of introducing information technology in the governance of our cities. Admiral Arthur Radford once said: "A decision is the action an executive must take when he has information so incomplete that the answer does not suggest itself." Governments in the world - cities among them - have one thing that nobody else does; enormous data bases about people, property and administrative functions. These data bases are generated from the day to day operations of the government. What information technology can do, and nothing else can, with these masses of data, is to make them available to decision makers at all levels in a meaningful and timely form for more effective problem solving.

The real world of urban governance today shows very clearly these problems and issues:

There is great public concern over the effectiveness or lack of effectiveness of local governments and its leaders.

Municipal officials are in a virtual information vacuum - unstructured data; not aggregated in a form necessary for effective analysis; and often times inaccurate.

Urban administrators spend most of their time reacting to events and taking corrective rather then directive actions.

The effectiveness of an urban administrator is determined to a great extent by the type, quantity, accuracy, relevance and timeliness of data he is able to absorb so that it does in fact inform him on critical issues.

Judging effectiveness of municipal operations is by the means rather than the ends.

Costs of providing municipal services are increasing rapidly.

## Impacts - Some Overriding Concerns

I look at the use of information technology as providing all levels of urban management with a focus on the ends rather than the means by reducing the information gap to include structured, accurate and timely information on:

Community needs

How to best meet community needs

Evaluation and monitoring of programs designed to meet community needs

How programs affect lives of citizens served

Therefore, one major institutional impact of information technology on urban governance should be a heightened capacity of urban administrators to better meet the problems and issues facing today's local governments by:

Improving the overall ease and efficiency in data and information handling, including the speed, accuracy and redundancy of such.

Increasing operating efficiency and effectiveness throughout the city's operations.

Speeding problem and need identification for improved program formulation.

Providing data and information to better plan for long-range improvements and programs.

For all of the glowing tributes on the need of information technology in urban governance, though, one should not forget that, even if we are successful in applying this approach, the great bulk of municipal decision making lies beyond the scope of precise and explicit information. To solve the kinds of critical problems facing us, information must be blended with intelligence, wisdom and a large measure of luck. Each ingredient in isolation is likely to be less and less useful. City problems cannot be seen in isolation, nor solutions implemented in isolation.

One therefore not only needs to have a thorough grasp of what information technology in urban government can and cannot accomplish, but one also has to be aware that the introducing of information technology in local government will have certain institutional impacts which could, in fact, be counterproductive to the perceived benefits of this technology. The institutional impacts of information technology on local government are, in general, not mutually exclusive from both impacts on the community and individual. Whether or not information technology can, in fact, greatly assist urban administrators in solving our cities' problems, it does seem destined to change them profoundly. Fredrick Withington in his book, The Real Computer, suggests that the very presence of information technology and the computer in organizations creates changes in them - operational, managerial, planning and structure - with benefits and costs to the organizations, the public and individual.

Let me then spend the remaining portion of this presentation in a discussion of the institutional impacts of introducing information technology in Wichita Falls.

We have just concluded a five year multi-million dollar research and development effort to design, develop and implement an integrated municipal information system. There were successes and failures in this effort, which we are continuing on a more modest basis at this time with local funding. The clearest conclusion that one can reach on the results of this effort though, is that the introduction of information technology in Wichita Falls has had profound impact and created change.

**Organizing for Information Technology Implementation - Wichita Falls As a Case Study**

The real world of information technology as it applies to local government indicates strongly that there are few individuals available in or for local government employment with the technical skills necessary to handle this new technology. Constraints of geographic location; salary relationships within the entire organization; sheer size of the effort; newness of the technology in local government; and recruitment techniques tend to limit local governments in their ability to attract and retain competent technical personnel. Consulting firms were found to hold the key to the technical expertise necessary for information technology. A single organizational unit was therefore created to implement the information technology project composed of consultants, existing city staff personnel from data processing and newly employed technicians on the city staff. The organizational unit was headed by an Assistant City Manager.

From the beginning this organizational structure created both internal and external impacts. Many of the consulting firm's personnel were receiving much larger salaries than the city's personnel who were doing similar tasks. Compared to the overall reputation of the consultant and the individual reputations of a number of people who were located in Wichita Falls by the consultant, city technical personnel had something of an inferiority complex. Consultant personnel, because of their level of expertise, became task leaders for design, development and implementation of information technology. These task leaders often had the responsibility of first line supervision over city personnel controlling the rewards and punishments of employment. The commitment of the consultants to the project and to the city in terms of long term organizational maintenance vis-à-vis the commitment of the city's own technical and managerial personnel led to skepticism on part of the

information systems staff as well as other city personnel.

Although directions and content of information technology implementation in local government as with any new technology should raise many questions by city personnel, the type of organizational structure superimposed on an existing structure as implemented in Wichita Falls does not usually lead to positive impacts. Internal bickering among information technology staff caused by interpersonal conflict and status incongruity led to a high rate of turnover and a deterioration of developmental time spans. This resulted in operational personnel becoming cynical about new technology. There is little doubt that the consultants in new technological efforts with their strong will, high degree of self-confidence, and an aura of expertise and accomplishment had few misgivings over the value of information technology and what needed to be done for effective implementation. I believe that management needs to recognize the probable negative impacts from the organizational structure for information technology implementation upon local government for both the internal technical staff and external operational staff. From this recognition, a management philosophy must be developed that the city will "run the technological effort" and not the technological effort "running the city". With complete and continuous training efforts for development of city personnel, systematic efforts can be made to prepare the city for the kinds of change it will face in utilizing information technology to produce positive benefits in operating our cities.

## Organizational Impacts

Any technological effort of the magnitude of implementing an information system will have organizational impacts. New "brokers of power" will be perceived within the organization. Information is after all a key to power - who holds the key to entering, manipulating and retrieving information affecting the organization will have substantial power and status. Operational units of a city government generally control the flow of information through the organizational hierarchy. This information control from the source gives power and status to operational departments. In many cases this information is not shared with other operational departments.

Introduction of information technology in urban government has created a new set of ground rules on information control, power and status, with consequent organizational impacts. A centralized "staff" department normally will now be

the repository for data and information. It will control data handling throughout the organization; it will determine the information needs of user departments; it will work out arrangements for collecting and sharing data among departments; and schedule information dissemination deadlines. Information management will be out of the hands of operating departments. A high dependency on an agency not directly controlled by the operating department for information resources will take place. With those operating departments and managers who look at the control of information as an important factor in monitoring their hierarchical status, there will be a loss of power perceived.

On the other hand, information technology should emphasize the horizontal organizational relationships which should lead to a clearer and more widespread understanding of organizational interdependencies. It should also lead to a flattening of the total organization hierarchy. Although the power of information control will change, the long range efforts on the operating manager should be an increased ability to plan, manage and evaluate his resources in order to carry out more effectively his service delivery programs.

As alluded to previously, the supply of information systems technicians is short and the demand for them on the local government scene increasing. Compensation which has to be offered to obtain these technicians is many times way out of proportion to the established wage plan. This fact creates jealousies and morale problems within the organization.

In the long run the identification of information flows through the organization could very well lead to organizational structure changes. Information technology should primarily be perceived as a means of improving the service delivery system, and enhancing the operational manager's decision-making capabilities - not primarily as a method of implementing organization structure changes. A positive approach to this new technology needs to be encouraged within the operational staff if it is to have any chance of reaching its ultimate potential. Organization structure change, if any, would then be a by-product of the overall technological effort which involves a very systematic analysis of the entire organization.

## Goals and Priorities

Information technology has impacts also on the goals, priorities and levels of expectation of the organization. As with many new technological efforts there is probably

much "overselling" of benefits, and much "downplaying" of the problems of design, development and implementation. Both benefits and problems should be openly discussed by the organization and rational decisions made as to whether the commitment is there to "plow new ground". There also needs to be continuous discussion and evaluation of the efforts so that this commitment can be reinforced periodically.

As an administrative innovation in local government, information technology promises to have large and significant impacts on the city as a whole and especially on particular operational departments. As it generally turns out, one of the largest impacts will occur because of the long developmental time spans. Lack of development, a slow pace of implementation and outright failures will contribute to a skepticism about information technology. Levels of expectation will alternately rise and fall. This type of situation will enhance the difficulties of maintaining high levels of commitment and expectations and staff personnel will become cynical about the effort and often question its basic objectives.

Our experience also indicates that the organization will develop conflicts between the information technology personnel and user department personnel. These include disagreements over the purpose of systems to be designed, the operation of systems and the extent of systems development. A second source of goal setting and priority impacts will be found in determining what operations are to be handled and how. Another continuing impact is addressing the issue of the operational coverage of the system. Finally, there will be goal and priority impacts as a result of the differences in style between departmental personnel and information systems technicians. Each thinks differently and sees solutions in different ways. Management of the effort becomes very critical in balancing goals, priorities, levels of expectation and style differences between users and technicians.

Personal goals, priorities and ambitions of individual participants in information technology efforts cannot be divorced from organizational goals and priorities. Cities competing in the game of harnessing information technology to improve urban governance are few and therefore do attain much notoriety nationally and internationally. This notoriety is often projected to the individuals directly involved. Adverse impacts on the city from information technology efforts can therefore be overlooked in an evaluation and monitoring of the effort by top management because of the ego reinforcement one obtains by continuing to be "on the leading edge" of technology. I am certain that we have experienced some of this on the

part of consultants, technicians and management.

## Privacy and Security Impacts

As with other technologies, the concentration of activity in one organization or mechanism, creates a corresponding degree of dependence on it. "Having the eggs in one basket" gives rise to much of the emphasis on security. The interference with the ability of an information system to operate smoothly, has severe consequences. It makes no difference whether the interference is intended or unintended. The destruction of equipment or data, or the delay of the institution's ability to perform, renders the city unable to perform the service to the degree that the service delivery is dependent on the information system. It is not possible to devise a system which simply cannot be disrupted or destroyed, nor is it possible to develop a set of completely effective antidotes to everything that can disrupt or destroy an information system. However, problems can be anticipated and one can minimize the probability of the difficulties from happening. Furthermore, the destructive potential can be minimized.

Another related issue is the concern for "privacy". An information system is not capable of being, by itself, sensitive or discrete. The system, which can record, access, update, combine multiple records, and disseminate information quickly and easily, is capable of doing just that, without regard to the nature of the information it is processing. For example, suppose the city has developed and implemented a comprehensive tax system, law enforcement system, public health system, vital records system, and a personnel/payroll system. Unless care and vigilance is used in the design and operation of an information system, there is nothing to prevent an unauthorized operator (via terminal or in the machine room) from acquiring and disseminating information about individuals concerning arrests, venereal disease, illegitimate births, delinquent taxes, or personnel disciplinary matters.

The "state of the art" does not permit an absolute guarantee that unauthorized persons will never gain access to sensitive data nor can it be assumed that authorized personnel will never misuse sensitive information. The approach becomes one of minimizing the risks. The "state of the art" of information technology does permit the reduction, well below that of the level of the traditional file cabinet, of the probability of such "leaks" of sensitive data. Anyone who can get to it, day or

night, can access a metal file cabinet. The access to records in an information system is not only limited to who can physically get to it, but is further restricted to who knows how to operate it and to certain times.

Privacy and security measures will impact on the city because information technology will require the issue to be met head on by the legislative body, management, user departments and technical staff. What we can do is minimize the danger of destruction or disruption of the computer installation and the abuse of sensitive information, which could result in the failure of service delivery or possible harm to individuals in the community. Again, given the current "state of the art", the most practical approach is to concentrate on minimizing risk rather than the impossible task of achieving an absolutely infallible system.

### Conclusion

Institutional impacts from information technology will affect employees, departmental managers and supervisors, information technicians, departmental operations, decision making and citizens. It is obvious that introduction and development of information technology requires a total commitment from the participants. Understanding the process is a vital key to the development of support from all participants at all levels of municipal government. Participation of functional personnel, who understand the municipal process, and technical personnel, who understand the capabilities and limitations of computer technology, in a team approach will provide a city with the most effective strategy for accomplishing this effort.

Municipal departments which, heretofore, operated virtually as autonomous functions should recognize their interdependence with other functions of local government. As information flow, communication procedures and decision processes are examined, the dependence of one function on other functions becomes readily apparent. The position should be taken that it is imperative that each municipal employee understand his role in the development process and understand the impact which the final system will have upon him. Knowledge of operational benefits will help to build enthusiastic support of municipal employees for the technology. In other words, through orientation and training efforts as well as monitoring of progress, information technology should be perceived as being oriented toward helping the user - individual departments - to improve their delivery of services to citizens, which after all is our only reason for being. There will be adverse impacts

and problems with such a technological effort, but I would have to conclude that the ultimate implementation of information technology in our cities will produce substantial long range benefits.

# Community Impacts of Introducing Information Technology at the Local Level

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**Editor's Abstract**

During the course of this paper reference is made to the institutional responsibilities of local governments, the necessity of information technology for management, problems and prospects for improving the delivery of goods and services to the community, and selected activities of the City of Calgary in these regards. The paper concludes by drawing together arguments which point to information technology as a means for enabling elected representatives and the public to better comprehend options, and to make more informed choices and decisions.

**Résumé préparé par le rédacteur**

Ce document porte sur les responsabilités des administrations locales et sur la nécessité de l'informatique en matière de gestion, d'identification et de solution des problèmes. On y traite aussi de problèmes et de perspectives en vue d'améliorer la fourniture des biens et services à la communauté, et on présente un choix d'activités mises en oeuvre par la ville de Calgary dans ces domaines. Ce document se termine sur un ensemble d'arguments qui démontrent que l'informatique est un moyen d'aider les représentants élus et le public à faire de meilleurs choix et à prendre des décisions plus éclairées.

## Introduction

As the Chief Executive Officer of the City of Calgary, I will be presenting the viewpoint, not of an information technologist, but of a manager in the public sector at the municipal level. A manager responsible to a local government comprising a Mayor and 12 elected Aldermen. A manager responsible for some 7,000 employees, and an annual operating and capital budget totalling some $350 million.

Perhaps before I start I should comment that whereas our total dollar operation is small compared with the billions handled by senior governments, the diversity, complexity and political sensitivity of municipal operations are in many respects greater than those of the senior governments. Our revenues relate to quarters collected from swimming pool charges and bus fares. Our operations relate more directly to the daily needs and environment of the citizens. We are a grass-roots operation.

Some definition of terms will be helpful. My definitions may not be those of the technologist, but for the purpose of this paper:

| | |
|---|---|
| Local level | means municipal level; generally municipal government and in particular the Corporation of the City of Calgary. |
| Community | means the urban community comprising the individual citizens and the many communities to which each citizen belongs (business, residential, recreational, and cultural) and the urban community as a whole. In this regard it must be remembered that the citizen is also a member of the larger communities of his province and Canada. |
| Information technology | means data so processed and manipulated as to facilitate the evaluation of an operation, the assessment of alternatives, the establishment of policy and the making of decisions. |

The stage is now set. The viewpoint has been stated and the terms defined.

What is the impact on the community of introducing information technology at the local level?

## The Forerunner

The forerunner of information technology, as I have defined it, was computer technology or phase one of the data management revolution. This comprised data collection,

data storage, data retrieval and functional mathematical computations and applications. It has been largely directed to the management of very large volumes of data directly related to a specific function and is processed so that the function can be more quickly and accurately operated and so that the interplay of many variables can automatically be calculated at unbelievable speeds. The guidance system for a rocket to the moon would be an example of a very sophisticated application. A municipal assessment, tax or payroll would be a relatively simple application.

At the local level, computer technology has been steadily moving into every phase of our operations, whether it be accounting or organizing the use of facilities in connection with minor hockey programming, whether it be the remote operation of sewage treatment systems or personnel records.

**The Community Impact?**

It is not very different from the technology elsewhere.

(a) Visibility The printouts, assessment and tax notices, the payroll cheque, the T4 slip and the forms designed for computer input are as much a part of daily life as the credit card, the bank statement, and the booking of an air flight. They are seen and observed as a mechanical clerk - an extension of the calculator and typewriter.

(b) Public reaction The computer was first a subject of wonder, then of fear of the machine, then of humour when the magnitude of possible errors was noted - but finally it is now taken for granted and is as much a part of life as the television set and the pocket calculator.

(c) Benefits As elsewhere, the community benefited by many savings. Saving of space and manpower. The better use of labour, materials and equipment. More accurate and up-to-date information. Better control. The direct impact of computer technology has been improved operational efficiency.

The computer has had some important indirect impacts:

(a) Bigness It has made possible, and economically attractive, big business and big government, to a degree that would not have been practical without computer technology.

(b) Centralization As in the private sector, computer technology has necessitated and made highly advantageous the centralization of records and data.

(c) Decentralization of service and decision making has been made possible to a degree previously impractical. All data of the centralized system can be brought closer to the branch or outpost than the nearest filing cabinet. At the local level, data can be made available to the citizen, more quickly, more accurately, and more conveniently than in the past.

(d) Errors Every system is subject to error. The computerized system is subject to big errors. These are often difficult to detect and difficult to correct. the implications of errors are correspondingly great.

(e) Confidentiality This is an area of increasing concern.

However all this is but the forerunner of the problems that have been created at the management and policy making level.

**The Need for Management Information Technology**

Computer technology enables us to carry out large and complex functions with increasing efficiency. Information technology is now as essential to management effectiveness as computer technology is to functional efficiency.

Management has the complex task of:

evaluating the worth of, and the need for these operations
defining needs and priorities
assessing alternatives and their costs
establishing policies, and
making informed decisions

Unless we can accomplish these tasks with far greater skill and expertise, and less by the seat of our pants, the final impact of computer technology on the community may be disastrous. We may be efficiently, and on a gigantic scale, doing the wrong things at the wrong time on entirely the wrong assumptions. (There are some classic examples in both the private and public sectors.)

Data, processed to facilitate these management tasks is urgently required. The data are generally available, but isolated to serve specific operational functions. The technology of urban information systems is in its infancy.

The complexity and sophistication of functional operations have tended to move policy and decision making to the operational expert. Information technology

must make it possible for the public and its elected representatives to regain their ability to comprehend and evaluate the options available and to make policy decisions.

In simple terms, the impact on the community of introducing information technology into urban government will directly relate to the degree that it enables government to serve the community more effectively and more democratically.

The costs will be high. The development of adequate urban information systems will be beyond the capability of each urban centre to develop within the time span that it is urgently required. Senior government assistance is imperative. The concentration of resources in developing an urban information technology adaptable to all urban areas is essential. Costs to urban communities of ignoring this need will be grave indeed.

It is anticipated that the impact of an adequate management information system on the daily lives of the community will far outweigh the impact of the first phase of computer technology. The lack of such technology will be like blindfolding the driver of a car racing down the freeway.

## The Calgary Experience

In the few moments remaining, I shall comment on some of the things we are doing in Calgary. What is our experience? What progress is being made in the real world? In this regard, I will touch on two key areas on which we are working.

(a) An urban evaluation system.

(b) Planned Programming and Budget System.

The first relates to the integration and manipulation of information to enable the public, the elected representatives and the Board of Commissioners to comprehend the major alternatives open to us, and their implications, concerning the form and shape of Calgary's growth.

The second relates to the reorganization of our accounting and budgeting system to better reflect and define what we are doing as a municipal government, what it costs, and who is responsible, so that alternatives can be better comprehended and evaluated and accountability more clearly stated.

## An Urban Evaluation System

Very briefly, in 1972 the staff developed a proposal to develop a common data

base which would enable the interrelationships of all the significant factors influencing and affecting urban growth to be so arranged and integrated that the many options could be examined and evaluated. Without the computer the interplay of all the variables is impossible. Such a program is very costly especially as it is exploratory and experimental. It requires major financial support from the senior governments. City council supported the proposal by an 11 to 1 vote. The province hesitatingly agreed to a small contribution and passed the proposal on to the federal government. The federal government expressed considerable interest - and that's all.

Calgary has had no option but to press on with a much modified program spread over a much longer period. Major policy decisions involving millions of public and private dollars and the quality of life of 450,000 Calgarians are being made each month on totally inadequate information and with only a limited comprehension of the implications of such decisions to the economic, social and cultural life of our community.

Major decisions are now based on the criteria of numerous separate operations. The interaction of these individual recommendations is not clearly understood. The coordination of these recommendations into a comprehensive set of alternatives which can be intelligently evaluated will not be possible until information technology can be developed to sort and manipulate available data into a comprehensible form.

The preparation of an integrated information system related to the physical growth of urban communities is not only essential but critical in terms of time. Such an information system is needed by the entire urban community of our western world where the speed of growth and change do not permit us to evolve and develop solutions slowly by trial and error.

It is understood that the United States Government has undertaken some research in this area (USAC)[1] and we are endeavouring to use such expertise and technology from this quarter as we can. I believe some of these people are here today.

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[1] Editor's Note: USAC is the acronym for Urban Information Systems Inter-agency Committee, which is discussed in detail in R.O. Symmes' paper.

## Planned Program Budgeting System

This system is undoubtedly familiar to all of you. It endeavours to arrange the budget so as to demonstrate:

what we are doing -- and why

what it really costs

what alternatives there are by way of program or level of service

who is responsible for the program

As we organize our data to provide answers to these questions, a new perspective is given to our operations.

When we started in 1972, we had some 200 programs. In 1976, these have been reduced to about 100 as a result of better definition and understanding. In fact, we have no more than 14 financially dominant programs which may be disaggregated to 20 as some complex programs such as parks and recreation are more closely analysed.

What is clear is that the number of productive services to the community is strictly limited, and significant portions of our operations - and costs, support the basic delivery of these services. Law, personnel, management systems, data processing, accounting, assessment, tax, and so on, are all valid only to the degree that they make it possible to effectively deliver the basic services of police and fire protection, road construction, social services and so on.

The cost of these support services must, of course, be properly allocated to the productive services and programs in order that the true costs may be established, and to enable a proper evaluation of those services to be made.

Our information system is being revised accordingly to reflect more accurately the true cost of the major public services. It is a major and difficult task.

Similarly the cost of equity capital is rarely apportioned to the particular service, and more often than not is ignored. (The misapplication of capital funds was partially responsible for New York's financial problem.) This is more noticeable at senior government levels than at the local level. The reconstruction of our accounting systems to ensure that all support costs and the cost of equity capital are truly and accurately demonstrated at the program level, will in many cases change significantly the unit cost of providing one service as against another, or of providing one level of service rather than another.

It is becoming increasingly clear that the resources of society are limited, that choices must be made. Choices between public services and private services, choices between material wealth and quality of life. We can't have it all, as some have believed. The burden is upon us to make the options clear and to demonstrate the real costs. The program of financial restraint is bringing about a new look at the services we are providing and the level of those services. Only with the development of adequate information technology can these costs be accurately supplied in a timely fashion. Not until then can the community exercise intelligently its democratic choice of selecting priorities for services.

**Intergovernmental Sharing Programs**

As we are trying to clarify the muddle of governmental expenditures and programs, I must comment briefly on the impact of intergovernmental share programs on local decision making.

The sharing of costs and responsibilities has become enormously complex. These programs severely distort information as to costs, and warp the choice of priorities by those who make decisions at the local level. There is uncertainty as to who is responsible, and they add significantly to administrative costs.

What we plan to develop at the local level, with the help of information technology, we hope will lead to similar reorganization of concepts across all jurisdictions of the public service. Clarification of programs, clarification of costs, and definition of accountability.

To achieve this we urgently need information technology to be coordinated. We cannot afford to have all of us experimenting with these very costly concepts. As we move to an integrated data base and adequate information systems at the local level, we must look for integration of data between all levels of the public sector, not only vertically but horizontally.

The development of integrated data banks within urban municipalities that are interchangeable, and are so designed that they can be coordinated with senior government data banks, urgently requires a team approach and the attention of information technologists at every level.

One of the most important impacts that information technology is going to have on the future is, I believe, that all three levels of government will ultimately recognize the need for a single management agency for each productive governmental

service to the community. Sound management principles dictate that responsibility should be allocated to the lowest level possible.

The tangled web of services and support services, the involvement of all levels of government in administration, and cost sharing make the goals uncertain and accountability hazy in the extreme. We cannot afford three levels of administration for one service. The public sector must develop quickly the technology to meet the challenges which lie ahead.

We have spent three exciting years defining and refining. We think we know where we are going, but recognize that we've only just begun. In 1976 we are spending just under $1 million on systems design, a further $600,000 on systems implementation and over $3 million on data processing. To give you a rule of thumb for comparative purposes, this represents about 1% of out total expenditures.

## Conclusion

The impact on the community of introducing information technology at the local government level should be to restore to the public and its elected representatives a comprehension of its options and the ability to make informed choices and decisions.

## Discussion of Plenary Session A: Impacts

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and
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The three speakers, Gerald Fox, Dennis Cole and Michel Barcelo had as their responsibility the task of analysing the impact of information technology on the institution, the community, and the individual, respectively.

There was little straying from the subject but some aspects were covered better than others. An attempt will be made to highlight certain aspects, but more space will be devoted to analysis, analogues, and discussing some of the weaker points.

The first two papers describe different technological approaches to municipal problem solving and the resulting management problems encountered. Calgary is doing the work in-house at a much slower pace with less "traumatic" impact, whereas Wichita Falls utilized outside "expertise" with some shock to its internal operations but obtained faster results. There needs to be a cost-benefit study to determine if the faster results paid off and/or whether the slower long term approach cost more money because of the lack of utilizing existing technology or sophistication from outside sources.

Both cities have their information systems sections separated from user departments during the development stages. The impact on user departments and personnel appeared to be larger in Wichita Falls. Greater impact in the latter city would have resulted from the fact that Wichita Falls is a smaller city with fewer personnel. Having a small group of information technologists responsible for the development and implementation of an information system created some practical problems. Department personnel who generated and controlled their own information in the past felt under the new system that they had lost that control to information technologists, and that the loss of control was accompanied by a loss of power.

There is, under the new system, the positive effect of showing the true relationships among the various parts of the organization. One is able to see the information flows and the interrelationship among the various departments. Information and information flows do not follow the structure of the organization. Needs become

more important than bureaucratic hierarchy. Knowledge and use of this relationship gives the manager an "increased ability to plan, manage, and evaluate his resources".

As part of the implementation plan, goals and priorities were discussed with the department personnel within the cities. The fact that the user and the politician may have different goals and priorities was pointed out by the authors but not discussed in detail. This was probably the major breakdown in the papers. The effect of information technology on the overall goals and priorities of the institution, community or the individual was touched on by only one paper. How management, the council or individuals utilize the increased capabilities to set goals and priorities could be one test of a system. Perhaps the projects discussed have not been operating long enough to take advantage of this power or to measure its impact, or perhaps the problems addressed have not been of the magnitude that this increased capability has had much of an effect. The latter may eventually prove to be the case.

Commitment by top administrators and politicians was stressed by all as a precondition for successful implementation of the new technologies. They appeared to be unanimous about the fact that unless all levels of management - middle management, top management, and the legislative body - were in complete agreement that there was a need for the new technologies, there would be little chance of success. The lack of any agreement could have a major impact on any attempt to develop an information system.

The impact of information technology on decision making within the institution, the community or by the individual was basically omitted in the papers presented. Whether this was done by design, or the authors felt that while it was relevant it had little impact or little value for discussion, is not certain. The impact of information technology on decision making is another area where additional research needs to be done. Whether or not information technology improves decision making, reduces cost of government, (i.e. Does more information increase the percentage of correct decisions and thus lower governmental costs?), brings more individuals into the process, or permits cross fertilization of ideas, needs to be answered.

It was correctly pointed out that information technology and data are not in themselves, the "be all and end all" answer to problems. They must be combined with "judgment, intelligence, wisdom, and a large measure of luck". The key is the proper use of information technology. This can only be accomplished by top management and the legislative bodies working together.

The development of information technology at the local level is a long arduous

task. It cannot and should not be attempted alone or in a vacuum. Just as information flow does not adhere to the structure of an organization, neither does it adhere to a single level of government. Only one paper pointed out the need for intergovernmental cooperation. This cooperation would also necessitate cooperative financing from higher levels of government at both the provincial and the federal level. The impact of better information as a result of this type of cooperation needs to be explored.

It was pointed out that the need for information by government is going to increase. The impact on the individual is also going to increase. Citizen participation is important but this is a very small part of the issue of the impact of information technology on the individual. The individual is going to be affected whether he participates or not and whether he likes it or not.

## Financial Information Systems - The City of Toronto Approach

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### Abstract

The organizational structure of the City of Toronto places considerable demands on the information systems. The Financial Information system currently in use at the City allows for great flexibility in responding to the needs of different user departments. To each of the managers, the system looks almost tailor-made. The extensive use of computer terminals allows each user to specify his own financial reports.

### Résumé

Le système de renseignements financiers de Toronto doit répondre aux innombrables besoins créés par la structure administrative de cette ville. Le système présentement utilisé par la ville est très souple et répond aux besoins des différents services utilisateurs. Les directeurs de chaque service s'accordent à dire que le système semble être fait sur mesure. L'utilisation exhaustive des terminaux permet à chaque utilisateur d'obtenir des renseignements bien précis pour ses rapports financiers.

## Introduction

Currently the City of Toronto has in use one of the foremost municipal information systems in Canada. It is an information system that covers many facets of municipal affairs and provides facts about people and property, financial and operational data as well as regulatory information.

What are the criteria we may use to evaluate an information system? First of all it should be responsive to the needs of the user; and give him the information required. But it should also be selective, and not bury the user in an avalanche of paper, in which he may find a few nuggets of information. At the same time the information provided should be fresh and timely. Nothing is more frustrating than dealing with today's problem on the basis of last year's data. And finally the system should be flexible, because circumstances, and user requirements do change, and the usefulness of the system increases considerably, if the user has the option to "browse" for the type of data he requires at the moment, rather than be confined to a rigidly predetermined information structure.

## Requirements of System Users

In order to ensure that the system is responsive, we have to identify the user and his requirements. In our case the user is the City of Toronto. Looking at the City organization (Figure 1), we see that the administrative and operating departments (each headed by a commissioner) are all directly responsible to the Executive Committee and Council. The organization could be compared to that of a corporation, with a Board of Directors (Council), a chairman of the Board (Mayor), a number of vice-presidents (the Commissioners), but no president. This fact and the fact that the information requirements of the operational departments differ substantially from the requirements of the administrative departments have implications for the design of the financial information system.

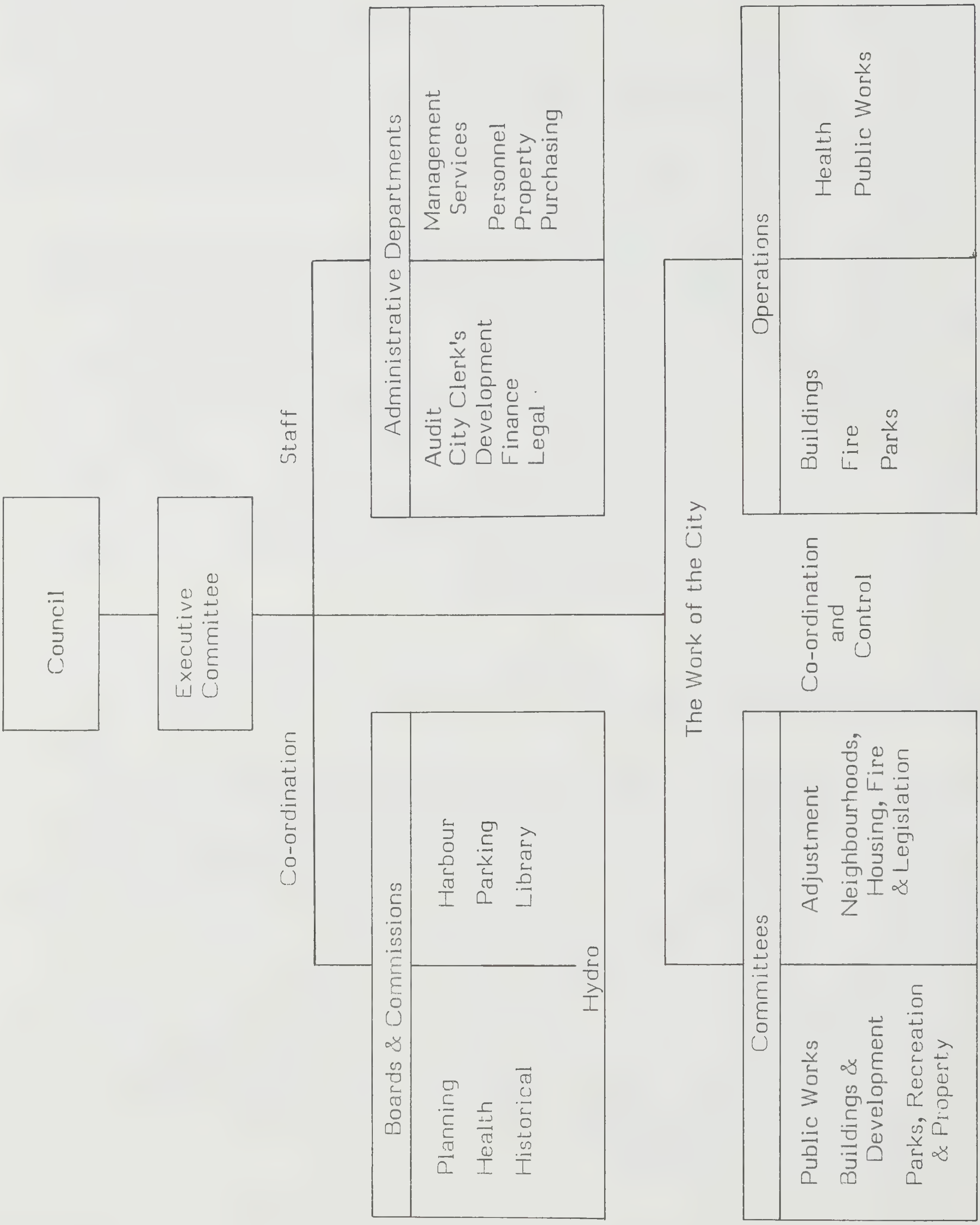


Figure 1 Organization Chart City of Toronto

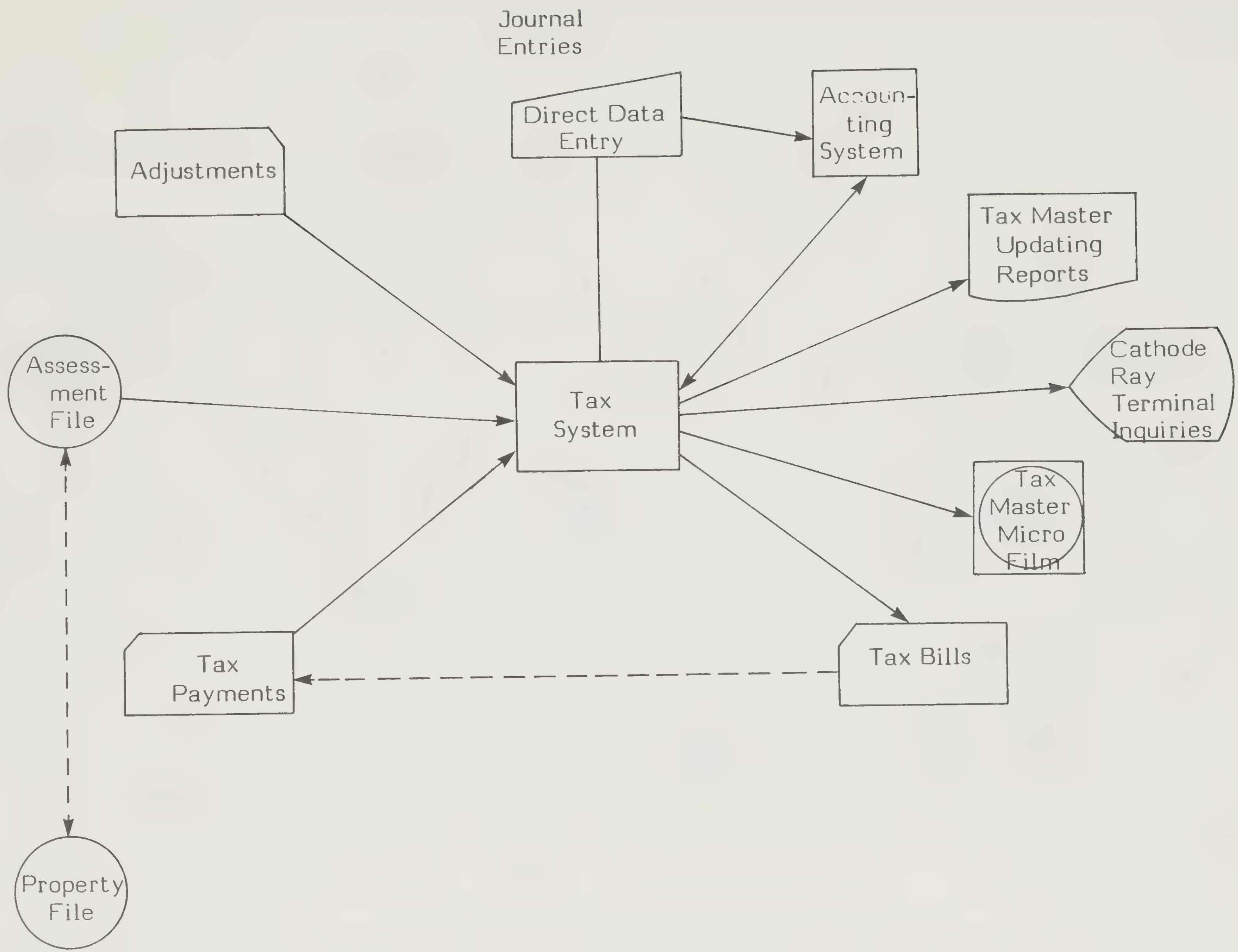


**Figure 2** Financial Information System City of Toronto

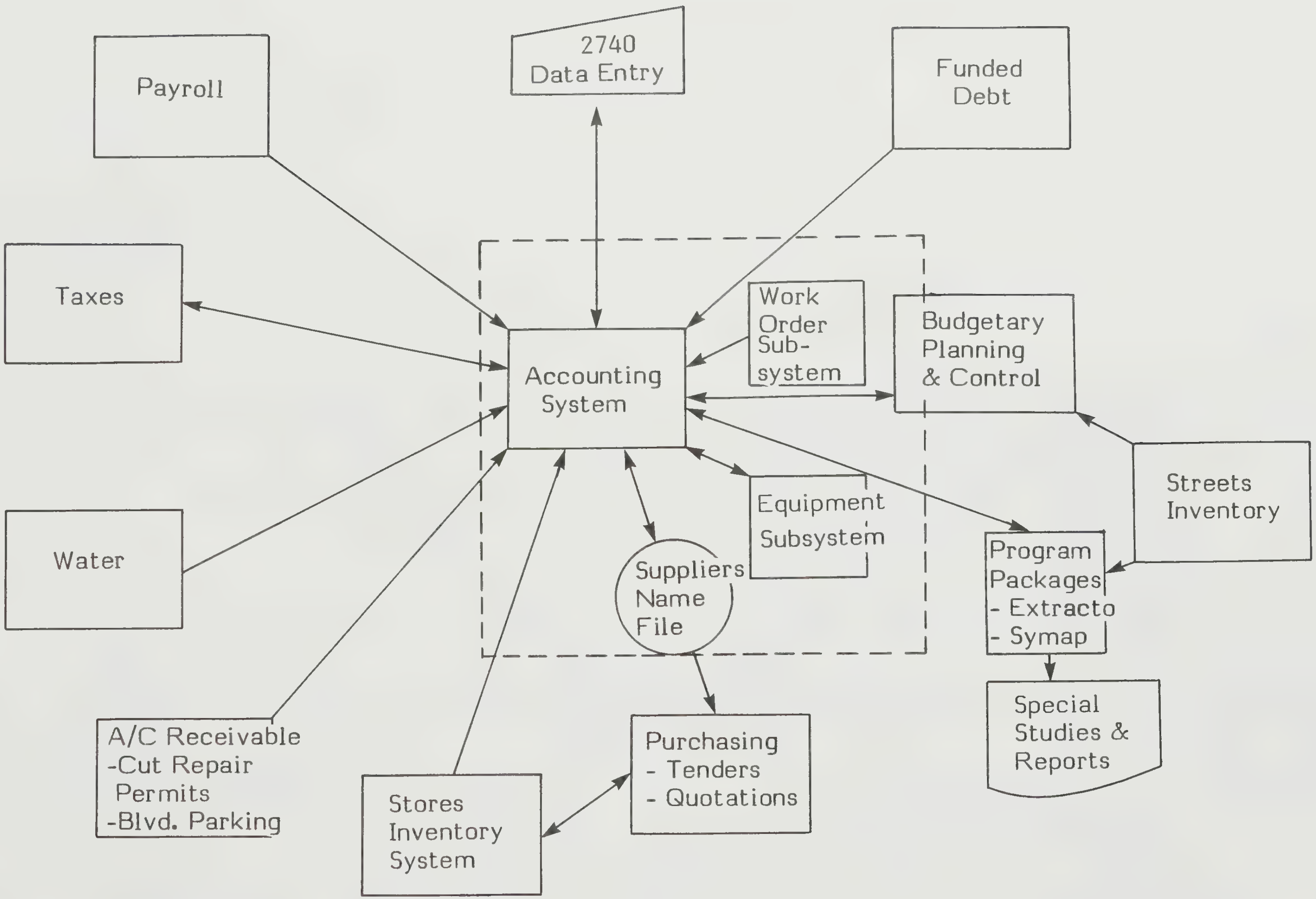


**Figure 3** Tax Information System City of Toronto

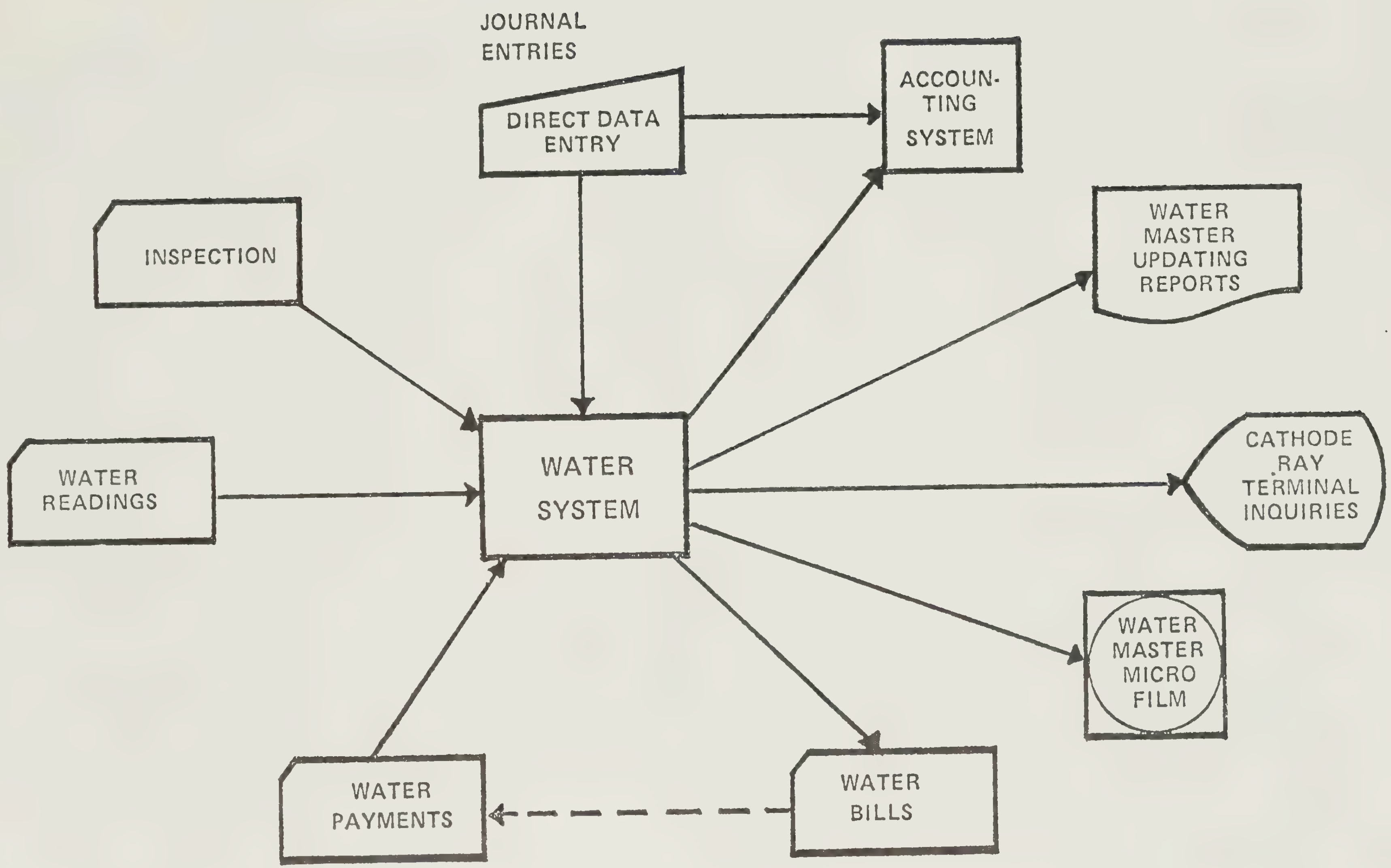


**Figure 4** Water Information System City of Toronto

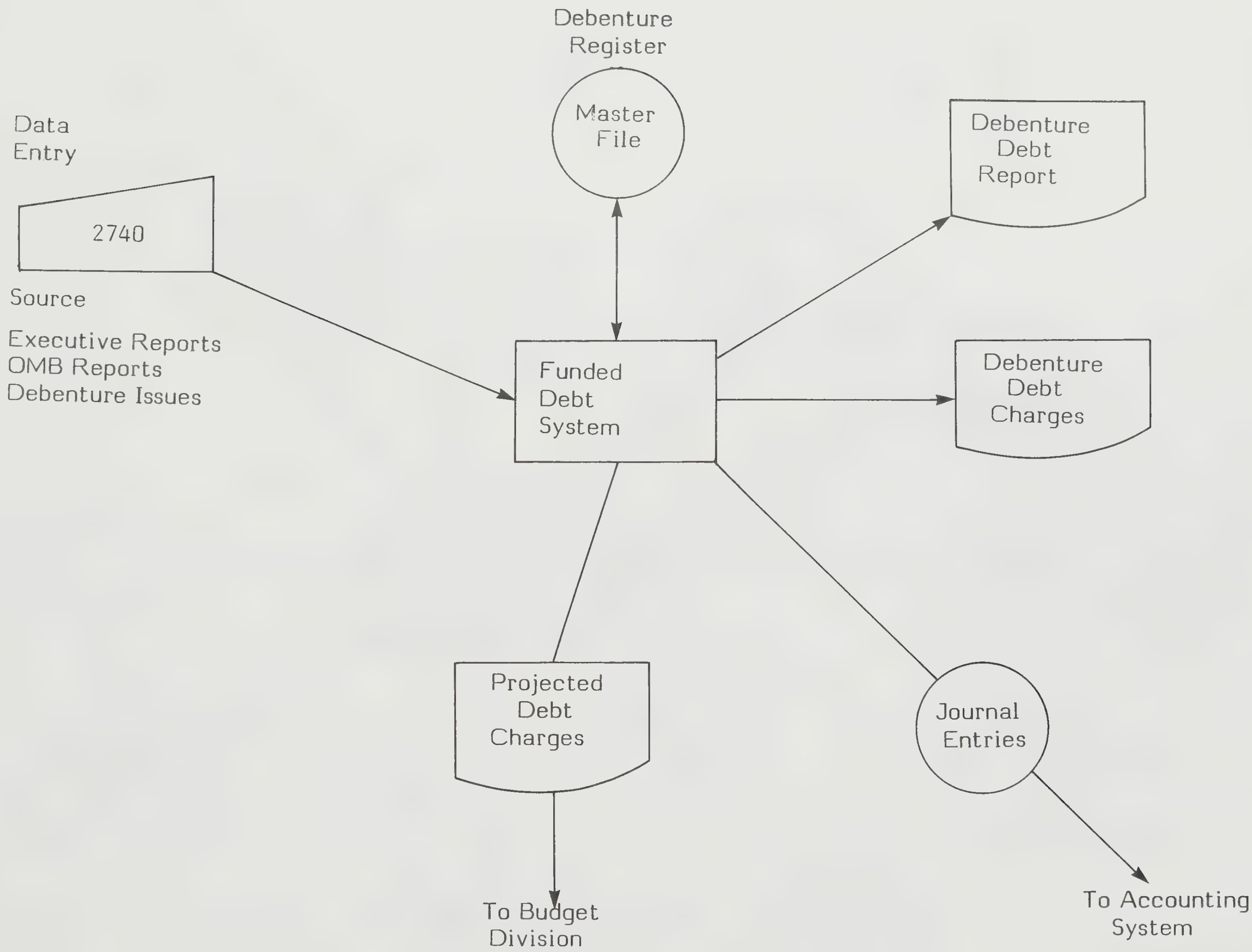


**Figure 5** Funded Debt System

## Financial Information System Responses

How has Toronto dealt with these different demands? The structure of the financial information system (Figure 2) shows that the total system consists of several separate systems that are hooked together in a number of ways, to form a very flexible information network. At the hub of the network is the Accounting and Budgeting control system. The Tax system (Figure 3), Water system (Figure 4), Funded Debt (Figure 5), and Payroll systems are independent systems, serving their own users, but still strongly interacting with the Accounting system.

## Code of Accounts

**Table 1** Account Code Structure

| | | | |
|---|---|---|---|
| 1 | Fund Code | 0 | Not Used |
| 3 | Major Account | 909 | Purch. Dept. |
| 3 | Sub Account | 250 | Equipm. Div. Operations |
| 1 | Year | 5 | 1975 |
| 4 | Feature (object) | 6220 | Garage Labour |
| 5 | Location | 91328 | Vehicle Number |
| 3 | Sub Location | 450 | Tires |

The code of accounts (Table 1) is central to the Accounting system itself, and gives it its tremendous flexibility and power. While the account code is large (20 digits), giving the possibility to descend into the finest costing details required, in most cases only 6 digits (major and sub account) are used. The accounts are grouped in a fairly standard fashion (Figure 6), and the most intensively used group of accounts is the 700 group, where we deal with the Operating Budget. The 4-digit feature of expense is little used in other account groups, but gives a second dimension to all accounts dealing with Operational, or with Capital expenditures. The location code is used in a variety of accounts, and accordingly has many different interpretations, depending on the application, e.g.:

Fixed Assets accounts: to identify a specific fire hall

Capital Works in progress: to identify specific capital projects

| PROCEDURE NAME | STANDARD CODE OF ACCOUNTS - DEFINITIONS OF ACCOUNTS, ACCOUNT CODE NUMBERS | PROCEDURE NO. 10-000-015 | PAGE 1 OF 17 |
|---|---|---|---|

SCOPE

The various accounts of the City have been grouped into nine different classifications, and in each group there is provision for a further 99 sub-classifications, under which the individual accounts are located.

PURPOSE

The accounts have been classified and assigned a code number for purposes of recording the City's transactions by electronic computer.

RESPONSIBILITY

All numbers are assigned by the Accounting Division of the Budgets and Accounts Department in co-operation with the various departments, and no new numbers may be created except by this means.

The account code is divided as follows:

| 0 | 000 | 000 | 0 | 000-0 | 00000 | 000 |
|---|---|---|---|---|---|---|
| Fund Code (not used at present) | Major Classifications | Sub Accounts | Year Code | Features of Expense | Individual Accounts (Work Orders, (Locations, etc.) | Sub-Locations |

The nine major classifications are as follows:

100 Current Assets
200 Capital Assets
300 Current Liabilities
400 Long Term Liabilities
500 Reserves, Surpluses and Deficits
600 Revenue Accounts
700 Expenditure Accounts
800 Public Utilities and Other Services
900 Departmental Work Orders and Suspense Accounts

* Denotes change from previous issue

| AUTHORITY FOR ISSUE | DATE OF ISSUE | SUPERSEDES ISSUE OF |
|---|---|---|
| COMMISSIONER OF BUDGETS & ACCOUNTS | January 1, 1971 | ALL PREVIOUS ISSUES |

010-910-001

**Figure 6** Sample of Standard Procedure - Describing Code of Accounts

Vouchers Payable account: to identify each vendor

Encumbrance Account: to identify each purchase order

Operating Budget accounts: to identify specific activities or projects

Work-order accounts: to identify each work order (used as project cost centre)

## General Ledger

The account code gives access to the General Ledger. The Accounts Master file, or General Ledger does not only serve the Accounting function, but also serves as the Budgetary Control tool. This file has a matrix format, containing, for each account code:

the annual budget

outstanding encumbrances

expenditures and revenues (the actual General Ledger)

the amount budgeted for each month (where applicable only)

This structure enables Toronto to very rapidly evaluate the status of each account. All accounting transactions are validated for availability of funds, giving each department tight budgetary control to prevent expenditures exceeding the budget. At the same time this structure allows rapid retrieval of budget and accounting information in a form meaningful to the line managers, as will be demonstrated below.

## Inputs

Because of the diverse requirements of the different departments, and the diversity of systems interacting with the Accounting system, there is quite a variety of inputs. The principle the City tries to adhere to is one-time entry of source data only, to avoid having to enter the same data twice, or more. Input data have one of the following forms:

Cards (turn around documents)

Diskette (keypunched from source documents)

Tape/disk (computer generated)

Data entry (through computer terminals)

All input is processed by the City's computer, an IBM 370/158, with 3,000,000 bytes of memory. It serves the City's approximately 110 terminals inside and outside City Hall. Two types of computer terminals are being used, the 3270 (video screen) and the 2741 typewriter terminals. Either type may be used both for data entry and for data retrieval. It is the extensive use of terminals that allows the City to present to each of its users the data he needs, when he needs it. In other words, the information is timely, selective and responsive to the user's needs.

## Reports

On the output side, information is available to the user in the following formats:

Printed
Microfilm
Terminal inquiries

The most volatile information, information changing from day to day, is supplied on the terminals, while monthly reports are supplied on paper or microfilm. In many instances, the monthly report is produced in full on microfilm, while a limited number of selected account ranges is printed on paper, to be used as working papers, mainly in the Accounting Division. Several reports, such as the Analysis of Vouchers Payable and the Analysis of Encumbrances are printed on a weekly basis.

## Use of Computer Terminals

The most interesting output is provided by the terminals. A short sequence of terminal inquiries may demonstrate the power of the system and the flexible use that can be made of the account code. These examples all relate to the Equipment Division. This Division operates as a self-sustaining unit (in the 900 major account group), which means that it pays for the full operating cost of the fleet, but offsets this expenditure by rental revenues, charged to the departments using the equipment. As the rental rates are set in advance for the year, tight control over expenditures is necessary, to avoid deficits. Management has the ability to exercise such control through terminal inquiries. To illustrate this point, a series of figures is presented and briefly described as follows:

**Table 2** An Inquiry into Account 909-250, the Equipment Division

The first column indicates how the feature expands the account information into a matrix. Features 100-200 deal with Personnel cost, while 300-700 gives details regarding cost of materials, equipment and services. The 900 feature group is used for Distribution Credits, and in this case indicates the amounts charged to other departments for the use of equipment. The second column gives the budget for the full year, the third column the budget to the end of the current month, the fourth column, outstanding encumbrances (i.e. commitments made, but not yet paid for, such as outstanding purchase orders), the fifth column, actual expenditures recorded, and in the final column, the amount remaining of the Appropriation, reduced by Encumbrances and Expenditures. The most important item on this inquiry is probably the bottom line, which shows that, while the Division is currently in a slight "loss" position, it is substantially on target.

**Table 2** Terminal Display - Year-to-date Balances of Budget, Encumbrances and Expenditures for the Equipment Division

21 20 909 200 75
12-31-75 @ 2-06-76

| Feature | Appropriation | Allotment | Encumbrance | Expense | Avail. Approp. |
|---|---|---|---|---|---|
| 000 | | | | 35,876.79- | 35,876.79 |
| 110 | 1679,874.00 | 1679,874.00 | | 1660,483.93 | 19,390.07 |
| 120 | | | | 1,782.93 | 1,782.93+ |
| 200 | 265,126.22 | 265,126.22 | | 243,775.82 | 21,350.40 |
| 300 | 1283,367.00 | 1283,367.00 | 2,551.20 | 1292,019.78 | 11,203.98+ |
| 400 | 18,750.00 | 18,750.00 | | 9,276.91 | 9,473.09 |
| 500 | | | | 264.24- | 264.24 |
| 600 | 2715,631.00 | 2715,631.00 | 1,579.03 | 2720,379.61 | 6,327.64+ |
| 700 | 1036,530.00 | 1036,530.00 | | 1103,206.85 | 66,676.85+ |
| 800 | | | | 556.68 | 556.68+ |
| S-TOT | 6999,278.22 | 6999,278.22 | 4,130.23 | 6995,341.48 | 193.49+ |
| 900 | 6999.278.22+ | 6999,278.22+ | | 7205,336.00- | 206,057.78 |
| TOTAL | | | 4,130.23 | 209,994.52- | 205,864.29 |

**Table 3** Terminal Display - Year-to-date Balances of Vehicle Operations in the Equipment Division

The Equipment Division consists of two sections: the Maintenance Garage (acct. 909-210) and the Fleet Operations Section (acct. 909-250). Note that as we gradually descend into the organizational structure, we start to use more digits of the account code. This inquiry tells us, that, while the Division as a whole runs almost at a break-even point, the operations Section has made a substantial "profit" so far.

**Table 3** Terminal Display - Year-to-date Balances of Budget, Encumbrances and Expenditures for the Equipment Division

21 30 909 250 75
12-31-75 @ 2-06-76

| Feature | Appropriation | Allotment | Encumbrance | Expense | Avail. Approp. |
|---|---|---|---|---|---|
| 000 | | | | 36,144.30- | 36,144.30 |
| 110 | | | | 17.60 | 17.60+ |
| 120 | | | | 1.00 | 1.00+ |
| 200 | | | | 25.35 | 25.35+ |
| 300 | 1226,232.00 | 1226,232.00 | 38.41 | 1194,789.77 | 31,403.82 |
| 400 | | | | .66 | .66+ |
| 500 | | | | 9.83 | 9.83+ |
| 600 | 2471,553.00 | 2471,553.00 | | 2406,879.20 | 64,673.80 |
| 700 | 1036,500.00 | 1036,500.00 | | 1103,176.35 | 66,676.35+ |
| 800 | | | | 556.68 | 556.68+ |
| S-TOT | 4734,285.00 | 4734,285.00 | 38.41 | 4669,312.14 | 64,934.45 |
| 900 | 4734,285.00+ | 4734,285.00+ | | 4810,806.14- | 76,521.14 |
| TOTAL | | | 38.41 | 141,494.00- | 141,455.59 |

**Table 4** Terminal Display - Year-to-date Operating Cost and revenues (900 feature) of Garbage Packer No. 93265

We now take a further step down, and start to use the location code in our inquiry. In the case of the Equipment Division the location code is used to identify each vehicle in the fleet; the performance of each cost-centre can be evaluated quickly. Other reports, such as the downtime report, are summarized by equipment class (e.g. half-ton trucks).

**Table 4** Terminal Display - Year-to-date Operating Cost and revenues (900 feature) of Garbage Packer No. 93265

21 40 909 93265 000 75
12-31-75 @ 2-06-76

| Feature | Encumbrance | Expense | Total |
|---|---|---|---|
| 300 | | 1,763.80 | 1,763.80+ |
| 600 | | 4,688.40 | 4,688.40+ |
| 700 | | 2,826.44 | 2,826.44+ |
| S-TOT | | 9,278.64 | 9,278.64+ |
| 900 | | 10,732.32- | 10,732.32 |
| TOTAL | | 1,453.68- | 1,453.68 |

**Table 5** Terminal Display - Year-to-date Engine Repair Cost for Garbage Packer No. 93265

Finally, we add the sublocation code to the inquiry. Here the sublocation code identifies the major components of each vehicle, and in the example given Code 300 indicates engine repairs. Other codes identify expenditures on preventive maintenance, body, brakes, tires, etc.

Using these computer terminal inquiries, each manager has a tool at his fingertips, that allows him to browse through the relevant, up-to-date financial data for his organization, at the level of detail, or at the level of summarization he requires at the moment. Even more detail is available on the terminals such as expenditures recorded for individual features of expense (Table 6), a listing of location codes, within a specific major-sub account, that incurred expenditures during the current month (Table 7) and a listing of vouchers charged to a specific account during the current month (Table 8). Note that current month information only is available to this level of detail on the terminal, at the end of the month such information is spilled off on a microfilm or printed report.

**Table 5** Terminal Display - Year-to-date Engine Repair Cost for Garbage Packer No. 93265

21 50 909 250 93265 300 75
12-31-75 @ 2-06-76

| Feature | Encumbrance | Expense | Total |
|---|---|---|---|
| 300 | | 77.51 | 77.51+ |
| 600 | | 1,883.60 | 1,883.60+ |
| TOTAL | | 1,961.11 | 1,961.11+ |

**Table 6** Terminal Display - Year-to-date and Current Month Balances by detailed feature for the General Accounting Section (e.g. feature 661 = Maintenance and repairs to office equipment).

23 30 705 320 600 75
12-31-75 @ 2-19-76

| | YEAR TO DATE | | CURRENT MONTH | | |
|---|---|---|---|---|---|
| Feature | Expense | Encumbrance | Expense | Encumbrance | Estimate |
| 600 | | | | | 89 |
| 632 | 5 | | 5 | | |
| 634 | 38 | | 20 | | |
| 642 | 2 | | | | |
| 661 | 1,078 | 594 | 5 | 480 | |
| 692 | 28 | | | | |
| 694 | 155 | | | | |
| 695 | 1 | | 1 | | |
| 698 | 16 | | | | |
| TOTAL | 1,323 | 594 | 31 | 480 | 89 |

**Table 7** Terminal Display - Listing of all Vehicles that have current month expenditures for parts

24 10 909 250 345 75
12-31-75 @ 2-19-76

| Location | Expenditure | Location | Expenditure | Location | Expenditure |
|---|---|---|---|---|---|
| 92525-220 | 29.54 | 92585-040 | 36.19 | 93003-520 | 13.28 |
| 93192-210 | 5.21 | 93192-320 | 9.00 | 93195-240 | 16.52 |
| 93230-330 | 64.18 | 93230-350 | 123.71 | 93239-300 | 20.30 |
| 93265-300 | 68.74 | 93278-020 | 6.20 | 93423-550 | 179.70 |
| 93424-000 | 67.28 | 93629-330 | 24.13 | 93636-100 | 90.32 |
| 93641-350 | 31.18 | 93808-060 | 142.92 | 93930-090 | 36.90 |
| 93932-090 | 110.90 | | | | |

**Table 8** Terminal Display - Detailed transactions (Purchase Order) charged Processing Services

24 30 710 420 671 00000 000 75

12-31-75 @ 2-19-76

| Vouch No. | Encumbrance | Expenditure | Ref. No. Description |
|---|---|---|---|
| 12-75-26 | 409.15 | | PO-72699 Control Data Can Ltd |
| TOTALS | 409.15 | | |

**Work Orders**

Briefly I want to make mention of the Work Order system. This system allows departments to accumulate costs for specific projects, the cost of which may have to be distributed over several programs. For example, the project may encompass reconstruction of a street, including roadway, sidewalk, sanitary and storm sewer. Total gross project cost is controlled in the assigned work order account, while at the same time, on a daily basis, all costs accumulated in the work order are distributed to the different programs involved (i.e. the sewer program, sidewalk program, etc.) As a result the net cost of the work order is always at nil balance.

## Conclusion

In the short time available, I have only been able to let you have a glance at the extent of information available to any of the line managers at the City Hall. I hope I have been able to convey to you the tremendous flexibility built into the system, allowing each of these managers to make the general system look like a system tailor-made for his department.

## Land and Property Information Systems

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### Editor's Abstract

The Land Registration Information Service (LRIS) of the Council of Maritime Premiers has as one of its basic functions the implementation of a modernized system for handling data related to land use and land tenure. This paper overviews the history of LRIS, the LRIS program, benefits to be achieved, specific information problems of urban governments which LRIS accommodates, and the technology which underlies the LRIS program.

### Résumé préparé par le rédacteur

Une des fonctions principales du Service du cadastre et de l'information foncière du Conseil des premiers ministres des Maritimes est de mettre au point un système moderne de traitement des données se rapportant à l'utilisation des terrains et au régime foncier. Ce document dresse un court historique du Service et étudie brièvement son programme, ses buts, les problèmes d'information particuliers aux administrations urbaines qu'il dessert, et les techniques qui sous-tendent son programme.

## Introduction

Our society continues to grow more complex, and the need for planning becomes increasingly obvious. While refined planning methods require the use of detailed and well-organized data, there are many problems associated with the handling of such vast amounts of data which still require solution.

Until quite recently, the conventional wisdom applied to such problems called for the creation of giant data banks for multiple users. In the Maritime Land Registration and Information Service, we are convinced that this concept of a single monolithic system is no longer valid in the light of current trends in data processing design and technology. Consequently we have proceeded with the development of a series of linked or integrated subsystems, based on a land parcel file, which is proving effective in the Maritimes.

## History

The Maritime Provinces have been trying to resolve a problem which is common to many other provinces and countries. That is, we have an outdated system for handling information related to land use and land tenure.

Our three provinces encompass an area of approximately 52,000 square miles, containing an estimated 900,000 legal parcels of land. We have a total population of approximately 1,600,000 people.

The development of our multi-purpose cadastre (land registry) was begun in the late 1950s, when it was realized that a comprehensive program of surveying and mapping throughtout the Maritimes represented the logical starting point for any improvement.

Considerable discussion was also taking place then in the Maritimes concerning interprovincial cooperation. In 1965, the three Maritime governments authorized the "Maritime Union Study" to investigate the prospects for integration of government services in the Maritime Provinces, including the question of whether the provinces should consider political union to form a single enlarged province.

The Maritime Union Study did recommend a plan for political union, but that option was rejected by the three governments. In 1971, however, the governments of New Brunswick, Nova Scotia and Prince Edward Island agreed to establish a

Council of Maritime Premiers, through which they could provide a formal framework for promoting unity of purpose, for improving intergovernmental communications, and for carrying out joint programs. An early area of interest for the new Council concerned land.

Land transfers in the Maritimes are currently handled through a deeds registry system, which involves excessive time lags and the repetition (theoretically, at least) of a title search each time a transfer is made. This contributes to a higher cost of land, makes it more cumbersome to establish clear title, and poses obstacles to planning endeavours at the very time when there is increasing pressure to consider such factors relating to land use as arability, geology, land cover, ownership patterns, value, history, and so on.

The three provinces have adopted a joint program intended to resolve these problems and, to implement that joint program, called upon the Council of Maritime Premiers to establish a regional agency called the Land Registration and Information Service. Like any good governmental organization, the agency is now commonly referred to by its acronym LRIS.

## Summary of the Program

To accomplish the multiple objectives set by the three provinces, it was decided to organize the LRIS program into four phases of development.

### Phase 1 - Control Surveys

Control monuments, consisting of numbered brass caps set in a concrete base, are placed in convenient locations along the transportation routes. They are spaced at approximately 300 metres in urban areas, 800 metres in suburban areas, and 4,000 metres in rural areas. These monuments are connected to Geodetic Survey of Canada monuments (and thus to the North American Control system, and to each other) by very accurate surveys.

The precise location of each monument with respect to all others in the system is known. Thus, if one monument is destroyed, its position, together with the positions

of any points formerly related to that monument, can be easily recovered by reference to other monuments in the system.

It is intended that once this phase of the LRIS program is fully implemented, all legal surveys, photo control surveys, and construction surveys in the three provinces will be related to the monument network. This will allow for the physical location of property boundaries to be easily redetermined, even if the markers disappear; it will enable property boundaries and engineering structures to be accurately plotted on maps; and finally, it will enable engineering structures to be related to property boundaries.

### Phase 2 - Mapping

Aerial photographs are used to produce maps, showing natural features and certain man-made features like highways and railroads. These resource maps are very useful for land use planning in rural areas.

Urban maps at a larger scale are useful for the detailed planning of sewer lines, new buildings, streets, etc.

Both resource and urban maps are used to produce property maps showing the boundaries of all properties in relation to the monuments of Phase 1. This important step in the improvement of land records permits each property or parcel of land in the three Maritime Provinces to be given a unique number for speedy and certain identification.

### Phase 3 - Land Titles

This phase of the program is concerned with development of a computer-based system of land registration which will simplify the procedures, and greatly reduce the average time span associated with land transactions.

Originally a batch processing system was planned for Phase 3, but a 1974 report on legal ramifications of the program recommended an on-line system for administration of the new Land Titles Act. The computer system is used to centralize land registration data, to enable rapid and efficient retrieval of land information from remotely located office terminals, to enable the correlation and summary

of data required for planning and decision making, and to provide a computerized index to land parcel documents.

The new system of land registration (termed a Land Titles System) will provide guarantee of both boundaries and ownership of property. The guarantee of boundary will be possible due to the accurate location provided by the monuments of Phase 1 and the large scale maps of Phase 2.

### Phase 4 Multi-purpose Information System

The final phase of the program is the development of a land information service (land data bank) using as its core the land information acquired in other phases of the program as the basis to provide other detailed land statistics. This information will assist in community and regional planning, selection of power routes and industrial sites, etc., all of which require very accurate and up-to-date information.

### Benefits for Urban Governance

Since the subject of this Symposium is "Urban Governance", only the benefit to urban areas are specified herein. However, it should be pointed out that the program and its benefits, applies to rural, as well as, urban areas. It could be argued, in fact, that the program is of even higher benefit to rural areas than to urban areas. Rural areas currently have available to them much less than urban areas in the way of information and planning capability. Since they start from a lower base, their gain is greater.

Phases 1, 2, 3, and 4 are sequential and interrelated, and they each present distinct problems. Although the methodologies to solve these problems are being developed at different points in time, their containment within a single comprehensive program provides reasonable assurance that all solutions will be compatible.

The benefits of the program to those involved in urban governance are easily identified. The initial phase, establishing the system of control monuments, provides a common survey network for engineering, property, utility and planning surveys undertaken in an urban area. Not only does this facilitate these surveys by saving the expense of establishing a framework at the start of each survey, it also ensures

that the same framework (grid) is common to all surveys, thereby facilitating any subsequent integration of these surveys. As well, Phase 1, coupled with Phase 3, facilitates the determination of property boundaries and ownership. This is essential information for urban renewals, major city engineering projects and land banking.

As described earlier, Phase 2 provides basic planimetric and topographic line maps for the urban areas at scales from 1:1,000 to 1:5,000. Although some utilities require even larger scale maps for their projects, the maps which are done at these scales have provided the necessary basis for many urban planning projects. The urban areas and utilities are now spared the expense of initiating this mapping, and have a standardized basic mapping system on which assessment and planning can be based. Thus, not only are independent surveys integrated, but any mapping projects are as well.

Phase 3 of the program will provide up-to-date, accurate information on property ownership throughout the 39 counties in the Maritimes. It is being implemented on a county basis, with the objective of completing four counties each year. Once a county has been property mapped, these maps are kept up to date by a team of technicians, who use registry office records and assessment data in the updating job. As such, this phase provides a current record of changing patterns of land tenure. All this is valuable information for planning.

Phase 4 has the most dramatic impact on urban governance. In Phase 4 we are building a data file containing land tenure information, we are stimulating the creation of other data files, and we are developing software to manipulate various configurations of separate data files.

## The Specific Information Problems of Urban Governments Which the LRIS Program Tackles

Many information problems are of concern to urban governments:

a) identification of significant existing sources of information

b) accessibility of such information

c) integrity and currentness of data

d) ability to merge and then manipulate different types of data

e) comparability of data

There are a number of existing sources of significant land information presently available in the Maritimes. From these sources one can obtain such things as land tenure information, assessment data, census data, land inventory information as gathered by the federal government, as well as the map and monument information which are developed in Phases 1 and 2 of the LRIS program. The problems arise only when one tries to assemble and make use of the information.

Through the LRIS program, accessibility to this information will be achieved in several ways. First, each regional land titles office will contain land tenure information, monument data and maps of its counties. As well, certain areas in the Maritimes are being chosen for software development projects. Communication will be maintained with potential users in the area, and with contributors to the project. These projects are being supervised by LRIS staff located in Fredericton, and training is available for interested users who could benefit from being able to access these systems directly.

LRIS uses various media for the distribution of information. All documents, historical and current, that have been deposited in the registry offices are microfilmed. Although this was done initially for archival purposes - to act as a back up for paper documents - this microfilm can be used for the rapid retrieval of information. All survey and subdivision plans are also filmed, the bigger plans going on 35 mm microfilm; everything else is on 16mm film.

Paper and plastic prints of our maps are available in each regional land titles office. There has been an unexpectedly heavy demand in Prince Edward Island for the property maps available there.

The monument information is distributed in booklet form to practising land surveyors. The booklet is collated on a map sheet basis and contains sketches, maps, descriptions, and coordinate values for all stations on that map sheet.

The task of keeping information files up to date is left to those who gather the information, whether it be the LRIS or a local agency.

For example, the property maps and land tenure information files are kept up to date by LRIS staff who keep track of land transactions as recorded in both the registry office and in the assessment office. Assessment information files are kept current by reports from assessors in the field. Census data is the responsibility of Statistics Canada. We have developed software packages that permit the manipulation of several different configurations of data files, and more are being developed.

Assessment and land tenure data are being manipulated in the Saint John area. Property boundary and land inventory information have been processed with land tenure information. Federal land inventory information has been processed with locally gathered data. Since these manipulations can be done quickly on the computer, and require a minimum of human effort in accessing, sorting or display of data, the acquisition of information derived from these different files is a relatively inexpensive and efficient operation.

A final requirement of those involved in the overall governance of many urban areas is that of comparability of data files. The LRIS program is a joint undertaking by three Maritime Provinces, and as often as is feasible, the structure and content of different types of data files is made consistent throughout the area. Thus, analyses of developments in different areas of the region can be undertaken and validly compared.

## The Technology Used in the LRIS Program to Tackle Those Problems

Philosophy of the System The main problem we are trying to solve is an outdated system for handling information related to land. The solution consists of the establishment of an interprovincial agency to plan and administer a program of surveying, mapping, land titles introduction and land data bank development, in order to make a smooth transition to a new land registration system. As such, the data bank was part of an overall system.

In devising concepts and technology for the land data bank, we became aware of two major practical constraints:

a) No single data base (geographic or otherwise) can validly act as a common denominator for all other data bases; and

b) No single information system can handle all pertinent land related data.

While one may postulate that either of these boundaries could dissolve at some future date, neither of them can be overcome within the present state-of-the-art.

We have assessed current geographic data bases (their availability, structure, and utility) and the associated geographic information systems, and have concluded that the optimum path toward the development of a land information system is to

be attained by the technique of 'incremental integration'. This "Integrated Land Data Information Service" which we aspire to will be composed of linked subsystems, each complete in itself, and each designed to store, retrieve and assess one or more data bases.

The land parcel is a basic geographic unit. Parcels may be aggregated, through centroid calculation, to match resource, census, and other "macro" scale data. The parcel is also small enough to mesh well with "micro" level information. It is an ideal unit for the maintenance of several data types, notably assessment data, land titles data, and possibly some types of network data.

Because of the pivotal nature of such basic data collections, the 'Land Parcel File' was developed. It is a geographic file accessible by location and index number, and exists simultaneously in the "macro" and "micro" realms.

This approach to land information systems offers the following advantages:

Maximum flexibility is achieved in the selection of data bases and information systems. Both can be included randomly without affecting the overall operation.

Various data bases can be centralized at one point, thereby enabling the user community to contact only one agency. However, the actual physical storage of certain data bases could still be widespread.

A number of information systems handling complex data bases can be implemented at a minimum of cost and time.

Various data bases can maintain their original form, and hence maintain their original value for those who design and use them.

As each data base and information system is added, its value, in terms of implementation, operation, and user interests can be ascertained through test evaluation.

In its initial stages, the program for Phase 4 is following an incremental approach. Isolated projects are designed both to test our ability to implement an integrated system, and to determine user interest and demand. Several customized data sets have been developed on the basis of a small geographic area, in order to vertically integrate these often diverse data sets and assess their suitability for expansion to larger geographic areas.

One measure of success of the approach is that the parcel identifier number, integral to our land tenure file, is now being used in other files, by a variety of

different agencies.

Files Processed So Far During its first year, the LRIS concentrated its activities on beginning an inventory of available physical resource data and on introducing the concept of computerized resource information systems. Since then, LRIS has been studying various independent land data files in order to assess the feasibility of such files being merged or overlapped so as to conform to an integrated data bank approach. Data relating to one or more of the Maritime Provinces has been obtained from a variety of file sources, including such data as: the Canada Land Inventory resource data (i.e. agriculture, forestry, recreation, present land use, and wildlife); water quality and distribution; land ownership (owner's name, address, nationality, location of property, assessed value, history of ownership, liens, encroachments, mortgages); assessment (value of land, details about land, value of buildings, details about buildings, etc.) and census data by enumeration area. In our program, these data are stored, retrieved and assessed by computer systems at both Ottawa and the University of New Brunswick.

The technology for automating information systems is developing quickly. We are using both graphics and alphanumeric terminals in our projects, and are currently programming most of the land tenure software in APL. Although fast retrieval microfilm systems have not been exploited as yet, this may be a feature of the system in a few years. Automated cartography for map revision is also a probability for the future.

Agencies Dealt With Since the system relies so heavily on others who collect and use information, we have had to maintain close liaison with several agencies - to date, mainly government departments or crown corporations.

The Canada Geographic Information System (CGIS) was originally designed for large scale computers to store and process the vast amount of map information generated by the Canada Land Inventory (CLI) program of the 1960s. Currently, however, the CGIS is not restricted to the CLI data and can handle any map information composed of closed polygons. LRIS staff underwent a training program in procedures of the CGIS. All of the CLI and CGIS geographic data bases pertaining to the Maritimes are accessible or have already been put into the LRIS tape library.

General Survey Systems of Statistics Canada has recently developed a geographical information system to access the 1971 census data at the enumeration area (EA)

level, and since the block faces and EA's are geocoded, study areas can be related to other geographic data bases. This system is called the Geographically Referenced Data Storage and Retrieval System (GRDSR).

Statistics Canada has expressed interest in aiding LRIS to implement a version of the GRDSR at the LRIS, hopefully to be integrated with the CGIS, since both sources offer valuable information at the regional subregional level.

An LRIS representative has visited the National Capital Commission to become familiar with their land parcel based information system, which is used to produce land use zoning models.

We have been working with the Central Mortgage and Housing Corporation, New Brunswick assessment officials and Statistics Canada on a proposed "Integrated Data Information System" (IDIS). This system will initially be restricted to a data base covering the metropolitan area of the City of Saint John, N.B. It will provide an integrated data base of housing and land related data, permitting the user to select property records based on a variety of criteria, sort the selected records in the desired sequence, and perform computations. If the trial IDIS is successful, the scope of the system could be expanded to encompass a greater geographical area and a wider variety of information.

The LRIS program was recently submitted to the Ministry of State for Urban Affairs by the Council of Maritime Premiers as a Canadian Urban Demonstration Project. As a consequence, LRIS has been given financial support for the development of an information program to inform Canadian and foreign governments of the details of the program. As a part of this agreement a free-flowing information exchange has been established with that Ministry.

LRIS staff have been consulted by the Nova Scotia Department of Municipal Affairs in connection with a study being carried out in the Annapolis Valley. Models of land use based on CLI data were prepared by LRIS. We have recently begun communicating with planners in the New Brunswick department, determining areas of mutual interest.

The Directors of Assessment of the three Maritime Provinces, assisted by members of the LRIS staff, have been meeting to discuss common problems and to ascertain if similarities exist or could exist in the type and quality of their assessment data. A consultant has now been engaged to determine the benefits of further automation of assessments in the Maritimes.

Considerable liaison on a continuing basis is being carried on with officials of the New Brunswick Electric Power Commission. This organization is currently very concerned as to the future adequacy of their present information on the location of utility poles, underground cables, transformers, etc.

The Province of New Brunswick is engaged in an intensive study of its agriculture resources. LRIS has assisted by carrying out computer manipulations of CLI capability data. The New Brunswick Department of Natural Resources was similarly assisted in a recent forestry capability inquiry.

One of our most satisfying projects has involved working with the Land Use Service Center in P.E.I. to produce two reports on non-resident ownership. Another study attempted to overlay land use information on property information by means of school districts.

LRIS cooperated with a team of Deputy Ministers in Nova Scotia who were attempting to outline the priorities of the various government departments with respect to future land use.

Another area of continuing cooperation has been with the Maritime Resource Management Service, a sister agency under the Council of Maritime Premiers. This group distributes the LRIS aerial photography to various users in the region. It also carries out specialized engineering and planning projects for the three provinces, which enable them to provide us with useful suggestions as to the needs of the planning community.

## Conclusions

The LRIS system is meeting current demands, and is building to meet demands of the future. It is functioning, and providing a useful service to various branches of government in the Maritime Provinces. The keys to our success thus far seem to be that:

(a) Information files are based on the land parcel.

(b) Files are integrated rather than assimilated: we are brokers, not bankers.

(c) Dialogue is maintained with potential contributors and users of the system.

**Text Processing Information Systems**
**(City of Toronto)**

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### Abstract

The City of Toronto's Text Processing System is a computer based system for the preparation, editing, typesetting and retrieval of all departmental reports submitted to City Council. Reports are entered into the system by the clerical staff in the various departments using display terminals and final copy is printed out on typewriter terminals in the departments. Once the stored reports have been submitted to City Council they are made ready for the typesetting system by the addition of appropriate font codes (e.g. bold face, italics, etc.) page width and depth descriptions and other typesetting instructions. They are then typeset on a photo-typesetter and printed. These same reports are then transferred to the retrieval system for online retrieval. The retrieval system accepts a number of commands such as search, select, browse, etc. which allow the user to find and view documents pertaining to the search or select criteria. Hard copy of the documents may be obtained by entering the print command which results in the printing of selected documents at a slave printer associated with a given display terminal.

### Résumé

Le système de traitement des textes est un système informatique qui assure la préparation, l'épuration, la composition et l'extraction de tous les textes soumis au conseil de ville par les différents services. Les employés de bureau des différents services qui utilisent des unités d'affichage introduisent les rapports dans le système et une copie corrigée est dactylographiée par les terminaux des différents services. Après que les rapports enregistrés dans une mémoire aient été soumis au conseil de ville, on les prépare pour être traités par le système de composition en indiquant les codes de fonte (caractères gras, italiques, etc.), la justification et les autres indications de composition. La composition et l'impression sont exécutées par une photo-imprimeuse. Ces mêmes rapports sont ensuite transférés dans un système d'extraction qui effectue plusieurs opérations: il peut, en effet, chercher et trouver des renseignements précis ou encore rassembler une vaste documentation, ce qui permet à l'utilisateur de trouver rapidement les renseignements dont il a besoin. On peut ensuite obtenir une copie en clair grâce à la photoimprimeuse reliée à l'unité d'affichage.

## Introduction

In the day-to-day operation of city government, departments, citizens' groups, outside agencies and individuals submit reports, letters and other communications to the committees of City Council.

The committees meet once every two weeks to deal with these reports and make recommendations based on their contents. Committees may decide to:

adopt a report

defer a decision pending further information

adopt a report with amendments

reject a report

refer a report back to a department or to another committee.

As a result of a committee meeting, a committee generates paper flow in the form of 1) correspondence, 2) minutes of committee meetings and 3) the committee's typeset report to City Council.

The committee's correspondence consists of reply letters addressed to the agencies et al. submitting reports to the committee informing them of the committee's action with respect to a given report.

The committee's typeset report to City Council embodies the text of the reports considered together with the committee's recommendations.

Committee reports submitted to City Council are discussed at Council meetings at which time they may be adopted, further amended or rejected.

The proceedings of Council meetings contribute to the paper flow in the form of minutes to Council meetings and legislation (i.e. by-laws).

With 18 departments submitting reports to four standing committees, a number of special committees and Executive Committee, the volume of final typeset material for one year is approximately 10,000 pages at a cost of $400,000.

This volume of paper flow together with the tight time schedules of meetings results in a pressure packed environment in which every report is labelled "RUSH!".

The following diagram graphically depicts the paper flow described above.

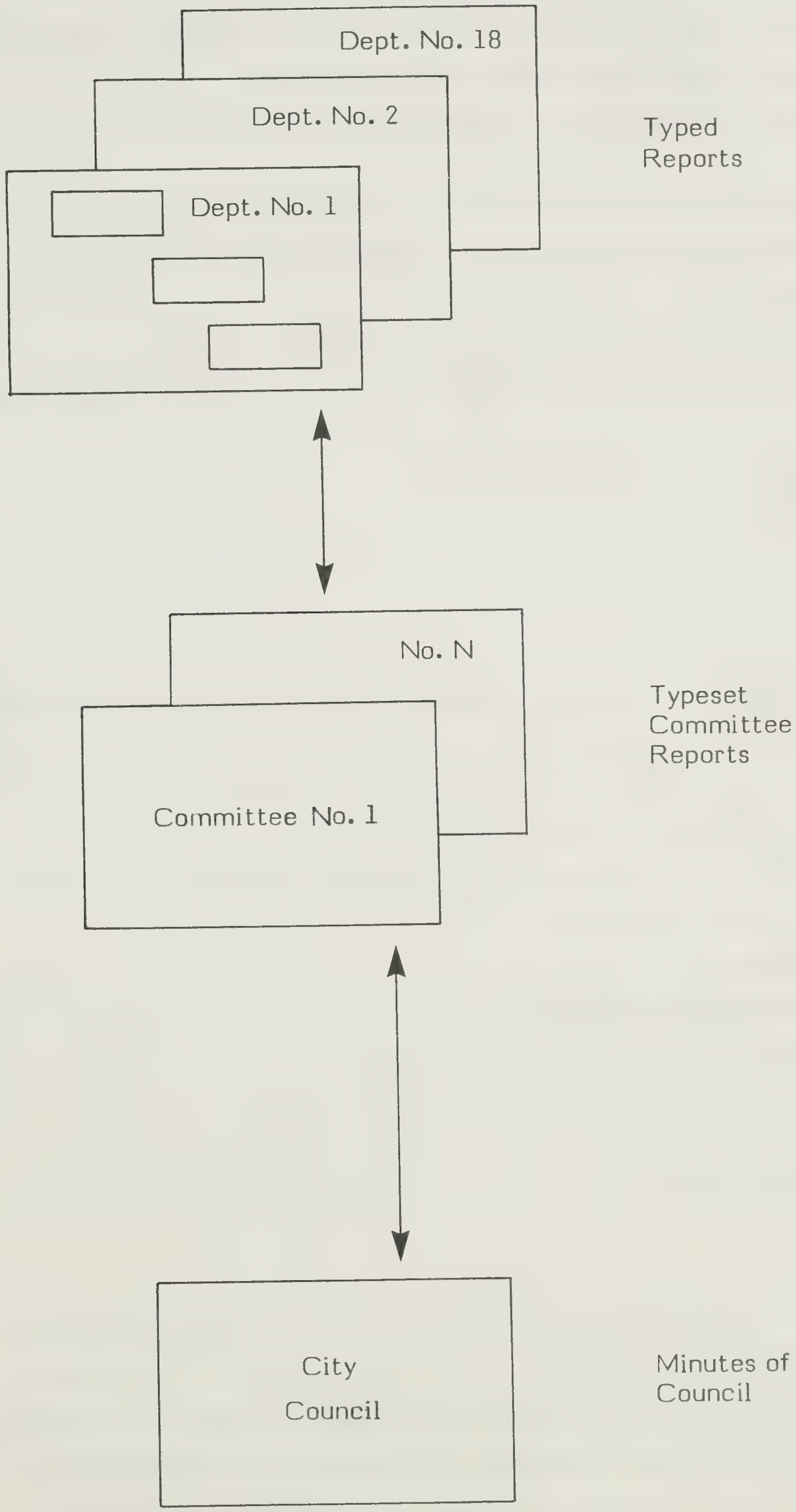


**Figure 1** Flow of Paper in Report Genesis

## The Problem

Inherent in the manual system of text processing are a number of time consuming, labour intensive, non-productive and costly activities such as:

(a) retyping of reports (reports may be retyped three to four times before final copy is produced)

(b) retyping of standard reports in which only a few lines are inserted or changed.

(c) detailed proof reading of reports by their authors (retyping can cause new errors to be introduced)

(d) manual typesetting of Council Minutes and Committee Reports.

(e) intensive word for word proofing of typeset copy by two clerk's working in tandem

(f) indexing of all minutes, reports and by-laws.

(g) maintenance of by-laws.

## The Solution

With the advent of large scale computer systems efficient and cost effective solutions to these problems are now available.

Accordingly, the City of Toronto has embarked on a major project to completely computerize its text processing function by the end of 1976.

The City of Toronto's Computerized Text Processing System is comprised of the following six major components:

1 Text Preparation
2 Text Composition and Typesetting
3 Text Retrieval
4 Indexing
5 Text Archiving
6 Text Base Maintenance

## Text Presentation

Text preparation is accomplished with the aid of the Advanced Text Management System (ATMS). ATMS is a terminal based system used to enter communications (i.e. reports and letters), by-laws, minutes of meetings and other textual material into the computer. ATMS embodies a variety of facilities which ease the text

preparation function. Textual matter may be modified, rearranged, deleted, extended and otherwise manipulated with ATMS.

### Typesetting

The quality printing of the "Council Minutes" is accomplished by the Typesetting System. The text entered into the computer is prepared for typesetting by the addition of typesetting codes. These codes specify the size and style of type to be used by the typesetting system in the printing of the minutes.

### Text Retrieval

Text retrieval is performed by the Storage and Information Retrieval System (STAIRS). STAIRS allows the user to quickly retrieve documents related to a given subject. Thus committee reports, committee meeting minutes, and by-laws may be quickly interrogated for information related to topics of interest.

### Indexing

The indexes of committee minutes, committee reports and the combined index to the "Minutes of Council" are produced by the Text Indexing System. Each department receives an index tailored to its needs and interests. Tailored indexes are made possible by "subject files" which contain the specific subject categories in which departments have expressed an interest. As new subject categories are required, the departments update their individual subject files and obtain new tailored indexes.

### Text Archiving

The archiving of reports and textual material is made necessary due to the limited amount of "online" computer storage. Currently, there is sufficient "online" computer storage. Currently, there is sufficient "online" storage to contain the text generated

during a year of operation (approximately 10,000 pages). As documents age and their information value diminishes, they are archived to "offline" storage in the form of magnetic tape. Archived documents may be retrieved to "online" storage should interest in them suddenly be revived.

### Text Base Maintenance

The ongoing maintenance of the ATMS and STAIRS data bases is provided in order to coordinate the entire text processing function. Maintenance of these data bases consists of the production of a variety of reports detailing the current status of the data bases, and taking appropriate measures, based on these reports, to ensure the orderly functioning of the system.

## Conclusion

The above components comprise a total text processing package, from initial text preparation through final typesetting, retrieval, indexing and archiving of textual material.

## Discussion of Plenary Session B - Applications of Information Technology

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In considering comments on the papers in this session, the general attitude prevailing at the conference was influential. Two major concerns were prevalent: the first concern was why there is not more portability of systems, and the second was about assessing benefits.

Contemplation of portability led to the notion that there is a need for "a body of knowledge applicable to design". This is what is portable, not the design itself. Using the usual engineering analogy, there is a large body of knowledge on bridge design. In preparing for the building of a new bridge an engineer would be expected to do soil tests and take other measurements. He would then use the "portable design knowledge" to design the bridge. Now the engineer might have a design from elsewhere that nearly fits, and which can be adapted to the new situation. It seems from this that we should be asking the question "what was learned from the application that can be applied elsewhere?" With this in mind the papers were reviewed to consider points of similarity and differences under the categories: technical, economic, and behavioural.

First under technical, all papers had the common feature of having masses of data to collect and to organize. All of these data would be retrieved in a variety of specified subsets and displayed in different ways. All applications required retrieval on demand. It is mentioned as an incidental fact that all three were computerized. All used interactive input-output devices.

In economic terms the systems are claimed to be cost/effective. Although laudable in intent, there was no evidence presented to support this contention. Perhaps more importantly, very little mention of alternatives was made except to compare each system with the "old" system. It would have been interesting to hear how these systems compared with competitive "new" systems. The economic comparison of alternatives is thought to be amenable, and yet the costs alone are difficult to establish and the benefits more so. Nevertheless more could have been done in these papers.

In the finance paper the behavioural problem seems to be to get management to make effective use of the system. The system is acknowledged as powerful and potentiallly useful but what incentive is provided for managers to use it? If they don't, what happens to any claimed benefits? It would be interesting to know how the City of Toronto has handled the mechanics of selling the system to management. We could label this a "getting it used" behavioural problem. In the Fruhwirth paper on text processing the behavioural problem seems to be one of training users to specify retrievals in a system-compatible way. The second behavioural aspect is the increasing access that people who are unspecialized in library searching have to the system. The increased access to information has social implications. For example, how many times could an elected official be found to contradict himself?

There are many behavioural, legal and social aspects of the paper on the land registry system presented by Simpson. These relate to the shift in nature between computer-stored and conventional instruments of recording property ownership. One wonders, for example, if a lifetime of investment in a property depends for proof of ownership on the absence of key-punch errors. The author has mentioned many devices that are contemplated to provide equity in the face of system error. The important point seems to be that the citizen must be responsible for verifying data about himself which are stored in the data bank. This is an activity that is entirely new to the citizen and indeed to the legal profession.

The behavioural spectrum that emerged was broad. At the level of implementation was the "incentive to use" question. Even more broad was the matter of greater access to information by management and the public, and the stress on management style that this creates as indicated in the text processing paper. Finally, there are social implications as the data bank and computer become an integral part of the social process, an example of which is the land registry paper. These points came out in the questions from the floor, but were given little attention in the papers.

Turning now to specific comments and questions, the papers will be discussed individually.

The financial application could become an extremely useful control device by the addition of a monitor to point out exceptions. Examples would be exception reports for auto fleets and tagging of cost over-runs. It appears as if the computer was simply used to speed up regular administrative procedures without asking if procedures should not be changed to fully utilize computer capability.

It would be interesting to know how to provide the human and physical resources in centres smaller than Toronto so they can experience the reported advantages. The utility computer can readily handle the facilities part, and specialists can be hired to develop the system for a particular municipality. The real problem is to create in the city management, the skills and outlook to deal with complex systems.

In the text editing paper the major concern among the audience was in the area of cost. Several suggestions were made about synonyms and such variations. It seems that all of these have been thought of in the application. It is still a question, however, of why the text material was not categorized into reports by department, for example. At worst you search for everything, at best you save a lot of search time. Other questions are concerned with why the many keyword and related systems were rejected in favour of a full text search retrieval system?

In the land records systems, the future trends should have been explored more fully. The main initial benefit is the accurate surveying, marking, mapping and description of a land bank information system, but this is only one part of the offering. The system should assist in developing land use and ownership policies. Some respondents suggested using the fast search capability to cut down on the legal fees in land transfers. The author suggests a revised role for the lawyer, not a reduction in fees. A politically sound answer - we don't want computers legislated out of existence!

## Transferring R & D Technologies and Lessons Learned in the United States

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### Abstract

The "faith in technology" attitude prevalent in the U.S. extends to local governments, where large programs have been instituted to facilitate technology transfer, the process of moving a piece of technology developed at a high cost in one location to another location at a lower cost.

The paper examines the technology transfer of computer software among and into U.S. local governments by comparing the benefit claims of transfer software with new data on local government transfer activity and planning, and the harsher realities of actual transfer experience as expressed in six key points most often found in literature about information systems in local government.

This paper does not support or discredit claims about transfer in local government. Rather, it attempts to fill part of the void in rational discussion about transfer by offering broad perspectives on why more transfers do not occur and, in some instances, why they shouldn't occur.

### Résumé

La "foi en la technique" qui prévaut aux États-Unis s'étend aussi aux administrations locales, où l'on a mis sur pied d'importants programmes de transmission des techniques qui permettent le transfert, à un autre endroit et à un coût moindre, d'une technique élaborée à grands frais dans un premier endroit.

Ce document étudie la transmission de la périlogie entre les administrations locales américaines. On y compare les hypothèses de rentabilité de la transmission avec de nouvelles données sur les activités de transmission et de planification des administrations locales, et aussi avec les résultats moins heureux de la transmission, qui peuvent se résumer en six points clefs très souvent mentionnés dans la documentation touchant l'informatique dans les administrations locales.

Ce document ne cherche pas à soutenir ou à dévaloriser les hypothèses relatives à la transmission au niveau des administrations locales. Il cherche plutôt à combler quelques lacunes du côté de l'examen rationel de la transmission, en fournissant une vaste gamme de raisons qui expliquent pourquoi il n'y a pas un plus grand nombre de transmissions, et pourquoi, dans certains cas, elles ne devraient pas avoir lieu.

## Introduction

Everywhere we go nowadays, there is faith that some miraculous modern technology is waiting in the wings to make our lives better. This extends to local governments where large programs have been instituted to facilitate "technology transfer" - a concept that usually refers to the process of moving a piece of technology developed at a high cost in one place to another place at a lower cost. Nowhere can this trend be seen more clearly than in attempts to transfer computer software into and among local governments.

Most of the current literature dealing with information systems is highly optimistic about the ease and speed with which software transfer can occur, and is highly promotional about the dollar benefits to be derived.[1] Based on these positive claims, one would expect that substantial software transfer occurs. Yet, the current level of applications transfer in the United States is low. In a survey we recently

**Table 1** Survey Response Regarding Transfer of Computer Applications in Cities and Counties in the United States

| | Cities | Counties | Totals |
|---|---|---|---|
| Total number of local governments responding to URBIS survey | 381 | 288 | 669 |
| Percent of governments responding to transfer experience portion of URBIS survey* | 75 | 62 | 69 |
| Percent of sites with transfer experience among responding local governments | 18 | 29 | 22 |
| Percent of governments responding to transfer plans portion of URBIS survey | 66 | 52 | 60 |
| Percent of sites with transfer plans among responding local governments ** | 22 | 25 | 23 |

*Number of respondents = 284 cities and 179 counties
**Number of respondents = 250 cities and 151 counties

made[2] of the transfer experience in cities over 50,000 and counties over 100,000 population in the United States, we found that only 22% of the responding governments had transferred applications from another local government in the last two years. Only 23% of the responding cities and counties plan transfers within the next two years (Table 1). Additionally, the average number of computer applications transferred per site over the past two years is not very great - 1.4 applications in cities and 1.6 applications in counties.

**Table 2** Frequency of Transfer and Number of Applications Transferred in the United States

| | Cities | Counties | Total |
|---|---|---|---|
| **Have Transferred** | | | |
| Governments with transfer experience | 51 | 49 | 100 |
| Total number of applications transferred | 69 | 80 | 149 |
| Average number of transferred applications | 1.4 | 1.6 | 1.5 |
| **Plan to Transfer** | | | |
| Governments that plan to transfer applications | 40 | 30 | 70 |
| Total number of planned applications transferred | 59 | 59 | 118 |
| Average number of planned transfers | 1.5 | 1.9 | 1.7 |

The average number of applications planned for transfer over the next two years is essentially the same for both governments (Table 2).

Thus, few local governments in the United States are transferring computer applications at all, and few of those that do transfer more than one application.

This low level of transfer brings the claims about the ease and benefits of software transfer into serious question. If the dollar savings are as great as claimed by the promoters of transfer, why hasn't more transfer occurred? If transfer is so quick and easy, why have most governments with transfer experience in the last two years transferred only one application on the average?

The usual explanations for why technology transfer doesn't occur focus on technical limitations and human frailties that create barriers to innovation.[3] Such barriers undoubtedly operate with regard to transfer of computer applications as with other technologies. However, another explanation for the low level of software transfer may be more basic: <u>it simply is unclear who really benefits from application transfers, and given this uncertainty, few potential transfer participants are willing to risk engaging in transfer</u> (activities).

Theoretically, software transfer should benefit all participants. Local government managers get modernization at a price their strapped budgets can afford. Federal and state agencies, which assist local transfers or develop software for transfer, get high leverage from a relatively low investment by demonstrating nationwide benefits from their R&D programs. The data processing professionals, who are purveyors of the technology, get status, recognition and sometimes profit for their broker function. The department users in local governments get new tools for performing their jobs more efficiently and effectively. But are the payoffs of transfer really this clear-cut?

The actual experience with software transfer suggests that the benefits are ambiguous. More importantly, experience suggests that not everybody's interests are served by software transfers. Participants may gain some things they regard as important while they lose others. Some participants may have little gain relative to their required investment.[4]

## Examining Some Popular Beliefs About Software Transfer

The difference between the claims of benefits from software transfer and the harsh realities of actually doing transfer can be seen by examining six popular beliefs found in the literature on information systems in local government.

Belief 1 Transfer of computer applications prevents each government from having to re-invent the wheel.

An underlying assumption behind software transfer is that having each government develop its own applications is inefficient, if not wasteful. Therefore, software development projects should be done centrally and transferred to local government in order to prevent useless re-invention of the wheel. But this prescription overlooks the important learning benefits derived from re-inventing the wheel.

The process of developing computer applications provides the opportunity for individual and organizational learning which is essential to developing an EDP capability. Through in-house development projects carried out within the constraints of local skill, time, and money availability, EDP staff learn about various government functions, department users learn about EDP, and both develop working relationships that support future operation, maintenance, and expanded use of EDP. By contrast, software transfer by outside agents may actually prevent learning, especially when the application exceeds local capabilities, as the EDP staff and users are frequently under great time pressure and easily overwhelmed by the outside experts. In this situation, learning occurs after the transfer period, during operational use, when the staff discovers what assumptions underly its models of reality; then, they also may discover belatedly that the application is ill-suited to their environment.

Given that EDP is still in its infancy in most local governments,[5] learning opportunities which build local in-house capabilities are especially needed. Yet, it is these governments with relatively undeveloped EDP that are most often targeted for software transfer by the transfer agents on the deceptively rational grounds that the EDP capability gap is greatest here and ought to be the front line of attack.

Contrary to this popular belief, the best candidates to undertake transfer may be the governments with highly developed EDP. They can realistically assess the potential of applications <u>before</u> they are implemented by outside experts, and they can undertake the complexity of their own independent search, evaluation and transfer if they choose to.

Evidence supports this view. The survey of U.S. cities and counties cited above indicates that the greatest transfer tends to occur in the larger governments and particularly in governments with an advanced state of EDP development. The transfer governments tend to have higher EDP expenditures, spend proportionately more of their operation budget for EDP, have larger computer core capacity, and

have more operational, on-line, and documented applications than the average city or county in the survey, all of which indicates an advanced state of development (Table 3).

**Table 3** Comparative State of EDP Development among Local Governments That Have Transferred Applications in the United States

| **Indicators of EDP Development Status** | **Cities** | | **Counties** | |
|---|---|---|---|---|
| | Transfer Sites | All URBIS Cities | Transfer Sites | All URBIS Counties |
| Average EDP expenditures | $948,384 | $572,210 | $861,883 | $487,000 |
| Average EDP expenditures as a 1% of total operating budget | 1.6 | 1.0 | 1.7 | 1.3 |
| Average total core capacity in bytes | 515K | 165K | 470K | 338K |
| Average total operational applications | 39 | 28 | 39 | 30 |
| Average total operational applications on-line | 12 | 6 | 6 | 5 |
| Average total operational applications with documentation | 25 | 16 | 26 | 19 |

Belief 2 Everyone benefits from software transfer.

If software transfer yields all the beneficial things claimed for it, who could possibly resist transfer efforts? Depending on the situation, both the EDP and user departments might object.

Consider first the data processing professionals and users. In addition to the learning benefits from re-inventing the wheel, there also is personal and professional satisfaction to be gained by both computer professionals and department users from their own design embellishments of the wheel. Design is the sine qua non of the computer profession, and therefore many programmers and analysts view the design-development phases of automating a task to be a challenging creative

enterprise. By contrast, the transfer adoption process is generally viewed as unstimulating, even drudgery.[6]

Similarly, "professional practice" is to department users what design is to the computer staff. Personnel in the user departments tend to stress small differences in local practices as a means of maintaining their own uniqueness and professional superiority over their counterparts in other governments. Users frequently assert that "we are different from City A," "our department does not function like County B." Thus, many user departments are unwilling to accept a system developed for the "different" situation in another local government.

Data processing professionals and users are not the only people who may resist transfer. Managers in the EDP and user departments may interject considerations of resource, political and bureaucratic incentive in their deliberation about transfer. When development is done in-house, the monies essentially go to increase staff in the EDP department, the user department, or both. When software is transferred-in, some portion of the would-be development monies go outside the local government to the transfer agent, and the current staff generally is burdened with transfer participation without special budgetary support. The net effect is to reduce the substantive basis for future budgetary increases and the slack resources under the control of department managers in the local government.

This might be all right with the managers if they were rewarded for efficient resource use, but generally they aren't. There is no more professional prestige for managers than for the EDP and user staff from transfer-in: and, there are no resource rewards either. In fact, the budgeting-from-past-history practices of local governments means that managers generally will be rewarded with increased budgets only for accumulating staff in-house rather than for using outside resources, and for using their current staff inefficiently rather than efficiently.

Thus, both managers and staff in EDP and user departments are motivated to find shortcomings with transfer-in software. Each group argues on technical and professional grounds that local development ought to occur. And, the combination of such technological and professional arguments usually is compelling, even to chief executives who otherwise strongly favor transfer from another government as the best way to obtain a new computer program.[7]

Belief 3 Computer applications can be transferred and adapted for a small fraction of the time and money needed to develop them in-house from scratch.

This benefit is the major attraction of software transfer, and it is the dominant basis for promoters' claims. There is no doubt that substantial cost savings can occur from transfer, because most of the front-end development costs have been borne by others. The transferee need bear only modification costs to adapt the application locally. But, these cost savings occur only under the best of conditions: when the automated task is truly generalizable, when the software has been well designed for transfer, and when the software fits the transferee's current computing capability. More commonly any or all of the following technical problems may occur:

(a) The automated task is poorly suited to the local situation.

(b) The application is poorly documented.

(c) The application is poorly designed.

(d) The application is not designed for transfer.

(e) The application is part of an integrated system, and thus contains features not required for stand-alone use, or delivers its benefits only in an integrated EDP environment.

Thus, in any particular case, the costs of solving these problems may equal or exceed the development savings from transfer-in.

Belief 4 Transfer makes badly-needed software available at a low cost to all local governments.

Even if there are no problems in transfer, and development savings do occur, the savings are meaningful only if the transfer-in software meets a real need in the government and is economical to implement, operate and maintain. Despite the claims of proponents, not every local government needs sophisticated software, and the costs of ownership can outweigh the benefits. Thus, software transfers need to be viewed in terms of priority needs rather than simple availability, and in terms of full life cycle costs rather than the mere saving of development costs.

Assessing the need for transfer-in software is a universal problem. Many local officials are lured into software transfer thinking that they are "getting something for nothing," when in fact they may be getting something they don't need, or which meets local needs only marginally. This problem occurs because some applications promoted for transfer to local governments are designed primarily to serve non-

local needs, such as state and federal needs for criminal data and national statistics, and thus have only secondary local value if any at all. Often local agencies are induced to transfer these applications by slick promotional literature extolling the benefits of the applications, and by offers of technical assistance and financial support for the transfer-adaptation phase. Once implemented, local officials may discover that the application doesn't live up to the benefits claimed for it, yet it requires a continuing financial commitment for maintenance as part of the federal local agreement.[8]

Another question to ask about a software transfer is whether it will produce a net benefit over its full life cycle. Development savings from transfer may pale in the face of costs for operation and maintenance. Some applications simply are expensive to operate because they were not designed by the originators with operation and maintenance cost in mind. Others are expensive because the originators issue frequent changes or enhancements that have to be implemented. Still other applications are expensive because they require new data collection and updating procedures not previously performed by the local government. This is particularly true of "free" software offered by federal agencies which really establishes a new reporting system or gets the local government to accept responsibility for an activity not previously performed locally.

Thus, local officials who make the transfer decision on the basis of development savings alone may be in for a rude awakening when they encounter the low local benefits, and the life cycle costs connected with the automated task.

Belief 5 Software transfer is a way for local governments to bring themselves up to a high state of EDP development quickly.

Software transfer is frequently promoted as a quick "technological fix." Although appealing, this notion simply doesn't square with reality. As mentioned already, transfer is not occurring at a rapid pace, and most governments with transfer experience transferred only one application in the past two years (Table 2).

These findings should not be surprising. The search for transferable software requires extensive professional contacts, at least within the same state, because the number of applications available and acceptable for transfer is small and difficult to find. A rich network of professional relationships is likely to be developed only in larger, experienced installations that have gotten beyond pressures for showing immediate payoffs and adapting to vendor equipment changes.

Further, the assessment of somebody else's software is complex and requires that the transferee government have personnel with experience and sophistication at least comparable to the EDP staff and user department personnel at the source. Finally, even if search and evaluation aren't problems because somebody brings the application to the local government with a "Good Housekeeping Seal of Approval," the transferee still requires adequate staff skill locally to install it, or if installed by a transfer agent, the transferee needs adequate staff skill locally to maintain and redevelop the software.

Thus, successful software transfer requires considerable technical sophistication by the host government. It is not a quick, easy way to get such sophistication.

Belief 6 Technical factors, such as the lack of standardized computer hardware and programming languages, are the major barriers to software transfer among local governments.

The considerable variety in computer mainframes, operating systems, and peripheral devices used among local governments creates special problems in adapting software from one EDP environment to another. Most of these problems have known solutions, however, and do not present the same barrier to transfer that they once did.

While computer hardware and programming languages are becoming less important barriers to transfer, the problem of "design for transfer" looms large as a barrier due to human frailties. One frailty is the tendency of system designers to "suboptimize" by designing computer applications only to fit local conditions. This practice is rationalized on the grounds that generalized approaches will take more time and money to develop, involve commitment to greater hardware and software expenditures for operation, and inevitably result in compromises unacceptable to the local users.

A related human frailty is the preference of computer professionals to design for "leading edge" technology rather than for mainstream or current technology. This eases and enhances the designer's job, as the more advanced technology provides automatically many functions the programmer previously had to design as part of each application, and it permits sophisticated niceties to be built into the application. These features, which make the application unique and bring professional distinction to EDP staff and department users alike, can also render the application nontransferable.

Thus, the human tendency to design suboptimally for local conditions and to design for leading edge technology, frailties which afflict the EDP and user staffs alike, probably constitutes a greater current barrier to transfer than the lack of technical standardization.

### Summary and Conclusion

Software transfer is a logical idea and has substantial benefit, providing everything works right. But, the experiences of cities and counties show that frequently something goes wrong. Therefore, local officials who must decide whether to transfer a computer application from outside or to develop it in-house must soberly assess the complexity of the transfer-adaptation process and the technical and behavioral factors that constrain it. Much of the literature on transfer will not be of much help to them because of its strong promotional bias. Some of the government and private agencies with purported interest in assisting local governments aren't very helpful either, since these agencies have a conflicting interest to promote their own or others' software to local communities.

The preceding analysis suggests that local officials without previous transfer experience consider taking a conservative strategy towards transfer of computer applications. There are four elements to the strategy:

1 <u>Proceed cautiously</u> by engaging in transfer only after you have experience with developing computer programs in-house, by taking only one application at a time, and by evaluating several similar applications before choosing the one to transfer.

2 <u>Choose highly transferable applications</u>; that is, those kinds of applications which involve simple tasks, stand alone or operate independently of other applications, operate economically, fit your computer mainframe and operating system, run in "batch" mode, contain good documentation, fit the skill level of local staff, and currently operate in another local government similar to yours.

3 <u>Consider a complete "transplant"</u> - moving the application intact from one EDP environment to another identical one - rather than transfer for applications that are complex, on-line, sophisticated and integrated.

4 <u>Transfer from somebody you know and trust</u>, preferably in your locale, so that you, your department users and EDP staff can communicate frequently with your counterparts in another government or transfer agency.

## Notes

1 Robert Wilson, "A Planned Program," Papers from the Tenth Annual Conference of Urban and Regional Information Systems Association (URISA). Claremont, CA: URISA, 1973, pp. 95-98; James R. Paul, "FAMIS - A Study of System Transferability," Papers from the Tenth Annual Conference of Urban and Regional Information Systems Association (URISA). Claremont, CA: URISA, 1973, pp. 99-115. Steven Gottlieb, "Transfer?. . . No Way! Mine's Better than Yours," Papers from the Eleventh Annual Conference of Urban and Regional Information Systems Association (URISA). Claremont, CA: URISA, 1974, p. 441.

2 The survey is part of a research project called URBIS, for Urban Information Systems. The project objective is to evaluate information technology in local government. Two questionnaires - cne dealing with the EDP installation's environment and another with EDP applications - were sent to the data processing managers, and one questionnaire was sent to the chief executive dealing with their perceptions of computers and data processing. An overview of the project is provided in Kenneth L. Kraemer and John Leslie King, "The URBIS Project: A Policy-Oriented Study of Computing in Local Government," Papers from the Twelfth Annual Conference of Urban and Regional Information Systems Association (URISA). Washington, D.C.: URISA, 1976.

3 The literature on innovation is vast, but the following studies specifically focus on barriers to innovation: Arthur D. Little, Inc. and Industrial Research Institute, Inc., Barriers to Innovation in Industry: Opportunities for Public Policy Changes (Washington, D.C.: 1973); Organization for Economic Cooperation and Development, The Conditions for Success in Technological Innovation (Paris: OECD, 1971); Project SAPPHO A Study of Success and Failure in Innovation (Brighton, England: Science Policy Research Unit, University of Sussex, 1971).

4 Anthony Downs first suggested this hypothesis in "A Realistic Look at the Final Payoffs from Urban Data Systems," Public Administration Review, 27:3, pp. 204-210.

5 The state-of-the-art in local government computing is reported in: Kenneth L. Kraemer, William H. Dutton and Joseph R. Matthews, "Municipal Computers: Growth, Usage and Management," and Joseph R. Matthews, William H. Dutton and Kenneth L. Kraemer, "County Computers: Growth, Usage and Management," Urban Data Service Reports (Washington, D.C.: International City Management Association, 1976).

6 James N. Danziger, "Computers, Local Governments and the Litany to EDP," Public Administration Review (forthcoming, 1976).

7 In the URBIS survey, we asked chief executives whether it was better to develop an application in-house, transfer it from another local government, or transfer it from a private vendor. Over half (52%) of the chief executives favored transferring the applications from another government. Yet, only 22% of the cities and counties have transfer experience. The chief executive's preference seems to make a difference in the transfer sites. The number of chief executives who preferred to transfer an application from another local government was higher in the transfer sites than in the URBIS population (66% versus 52%).

The chief executive's preference also seems to be understood by the data processing manager in the transfer sites. The number of data processing managers who felt that the availability of low cost transferable applications was important or very important also was higher in the transfer sites than in the URBIS population (47% versus 37%). Additional information on the transfer issue and the preferences of chief executives is contained in William H. Dutton, "Major Policy Concerns Facing Local Executives," Nation's Cities, October 1975, 13:10, pp. 33-36.

8 The ACG/DIME system, promoted by the U.S. Bureau of the Census, illustrates the problem. The system, which is a method of coding data to geographic locations, was originally designed to assist the Bureau in its mail-out-mail-back procedure for census taking. The system requires verification and periodic updating locally because of frequent change in urban geography. The Bureau secures local assistance through "agreements" wherein the local governments receive matching financial support and technical assistance to implement and maintain ACG/DIME and access to various Bureau computer programs that will turn the system into a "tool for local decision making."

While the system is useful to various kinds of planners for community analysis, location studies and service boundary studies it serves urban decision makers only indirectly. Further, it is inadequate to meet day-to-day operational needs for geographic data such as that required for policy and fire dispatch; therefore the local cost of maintaining the system is considered by some to exceed the benefit. The geoprocessing studies of the USAC cities discuss this issue and alternatives to GBF/DIME. See for example: Public Safety Subsystem Project, Geographic Indexing Support System Conceptualization and Geographic Indexing Support System Requirements. (Long Beach, CA: 1973)

## Participation in R&D and Implementation Projects

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### Abstract

This paper deals primarily with the USAC (Urban Information Systems Interagency Committee) IMIS (Integrated Municipal Information Systems) Project. The basic objectives of IMIS are discussed and presented, as are the structure, scope and financing. Finally, the ADP systems transfer products are reviewed, along with several illustrative case histories.

### Résumé

Ce document porte principalement sur le Urban Information Systems Interagency Committee (USAC) et sur le projet Integrated Municipal Information Systems (IMIS). Les principaux objectifs de IMIS sont présentés et étudiés de même que sa structure, sa portée et son financement. Enfin, les systèmes de transmission des produits ADP sont examinés et illustrés au moyen de plusieurs cas types.

## Introduction

This paper deals primarily with a significant United States effort carried out during the first half of the 1970s. It presents one perspective on how the United States Government marshalled initiative, dollars, and talent in order to bring more of the potentials of improved information technology to its citizenry.[1]

## Background and Evolution of the USAC Program

By 1968, many local and national government officials, and members of the academic and information science communities, felt that for a variety of reasons, local governments had not realized the potential of information systems technology through prevailing approaches. At that time, no local governments were known to have analyzed the full range of their requirements for information, designed comprehensive systems to meet those needs, or built the major elements of such systems on an integrated basis. Further, and most significantly, such undertakings were judged to be beyond the financial capability of any individual local government, particularly if the results were to be documented in such a way as to maximize the opportunity for others to use them in order to avoid duplicative original work.

The U.S. Government established the USAC[2] committee in November 1968. USAC consists of representatives from 10 departments of the national government, chaired by the Department of Housing and Urban Development. USAC is currently sponsoring projects in five cities to develop major subsystems and elements of IMIS.[3]

The IMIS projects are planned to produce functional "modules" (e.g., to support fire fighting operations) of IMIS. Each of these is being fully documented in such a way as to minimize the need for additional work by other local governments that wish to use them. In addition, each of the projects will have produced many other components of comprehensive information systems that constitute a highly coordinated data base and data processing system, plus the procedures and other elements necessary to operate them. Further, they will have established the capacity to expand and operate their systems.

## USAC Program Objectives

A basic objective of USAC has been to provide an opportunity for <u>many</u> local governments to improve their information systems capabilities. Thus, as completion of the initial IMIS research and prototype development projects approaches, USAC is placing additional emphasis on facilitating the transfer of IMIS products to other local governments. Several other local governments have already utilized techniques of the IMIS projects in their own work. In addition to these examples of technology transfer of the processes of IMIS development, several other local governments have initiated the transfer of functional (e.g., management of vehicular maintenance) modules of IMIS.

USAC was formed in 1968, as just described. By mid-1969 an IMIS research and development program was designed.

## Municipal Government Component

It was decided to focus the USAC program initially on municipalities, because they are typically the basic unit of general purpose local government in cities, where the majority of the U.S. population resides. 369 cities with populations between 50,000 and 500,000 persons were contacted by their nationwide association, the National League of Cities, at HUD/USAC's request to determine their potential interest in participating in a USAC-IMIS research and development project. Some 269 of them replied affirmatively.

In the meantime, USAC assembled three key ingredients necessary to initiate the IMIS program: (1) Financial resources from several of the USAC member agencies; (2) an extensive request for proposal documents that set out the objectives, terms, and conditions under which cities might receive contracts and financial assistance to participate in the program;[4] and (3) temporary staff from member agencies to review proposals to be received, and to monitor the projects that were to be initiated.

Proposals were received by HUD/USAC from 79 cities by October 31, 1969. They were reviewed and analyzed in terms of rigorous technical and cost criteria, their substantive content, and the characteristics and qualifications of the proposing cities and other organizations that might assist them. Six cities were selected

to participate in the program in January 1970. Contracts were let in March 1970 for what was then estimated to be two or three year projects depending on whether a functionally comprehensive IMIS was to be developed, or one of the four major IMIS functional subsystems.

The basic environment within which IMIS and the USAC program and projects exist consists of three components and their interrelationships: local government, the national government, and the data processing and related industries. State government, and substate regional organizations of local government, sometimes also have significant impact on this environment.

There are some 400 municipalities with populations of over 50,000 persons in the United States. These municipalities are the unit of government which has the basic responsibility for providing a broad range of services and facilities to the residents of an urban area. These services and facilities support a diverse range of functions such as law enforcement, water supply, maintenance of general environmental quality, disposal of sanitary sewage, local transportation, building construction standards enforcement, fire suppression, vital record maintenance, restaurant health standard maintenance, training unemployed persons, and a variety of other functions.

These municipalities typically expend upward of 60% of their budgets for personnel costs, and derive upward of 60% of their revenues from taxes levied on land and improvements thereto.

Municipalities in the United States typically do not have responsibility for the provision of elementary or secondary education, the provision of personal and social services, income maintenance, or health services - other than emergency medical assistance and providing some environmental health services.

## National Government Component

The second basic component of the USAC-IMIS environment is the national Government of the United States, which has responsibility for dealing with a variety of needs, that, when aggregated from what may appear to be strictly local concerns, actually constitute problems at the national level.

The Executive Branch of the United States Government includes a variety of departments and agencies that provide assistance, primarily financial, to state and local governments in functional areas that are specified by legislation. These

assistance programs vary substantially not only in functional purpose, but in the terms, conditions, and eligible recipients of assistance. There were very few instances, as of 1968, where multiple agencies of the national government pooled resources on a prearranged, coordinated basis in order to provide support for a common purpose. In this context, the formation of USAC and financing its program on an interagency basis was an innovation itself, particularly for a major R&D program.

The formation of USAC was accomplished through a Presidential Executive Order and not through specific new congressional legislation. Such cooperation was encouraged by the 1968 Intergovernmental Cooperation Act. (In this connection, the recently enacted Joint Funding Simplification Act of 1974, Public Law 93-510, authorizes such joint funding on a regular basis, upon the request of an applicant for assistance. This is potentially of considerable importance to local governments seeking to develop their own functionally comprehensive information systems.)

## Information Technology Component

The data processing and related industries are an important third component of the IMIS environment for several reasons. First, the equipment and basic instructions ("systems level" software) for its management are generally designed, developed, sold, and basically serviced by the private commercial firms of this industry. The industry provides the overwhelming majority of advice, assistance, and training in the use of the technology to local governments.

Only in recent years has the United States Federal Government begun to deal with a community and its systems as a totality. In terms of computer systems,for example, it was typical until the late 1960s to approach a local government in categorical and functional terms. This meant that the funding of separate and distinct computer systems for planning, education, public works, housing, code enforcement, health, manpower and so forth resulted in data processing (and consequent service delivery to citizens) which was highly separated and isolated from one another. The net effect of this separatism registered in uncoordinated planning, management, and community development efforts.

For most public administrators, it is frequently difficult to differentiate one computer system from another. There are, however, wide variations in the

application and effective utilization of computers. Recent advances in computer technology, for instance, have led to the development of "integrated" information systems, quite distinct from "independent" systems. The latter characterizes computer systems of the 1960s. Integrated information systems may prove to have a profound effect on local governments in the latter decades of this century.

Once, a municipal chief executive or department head could manage his organization as a number of separate entities. Then, independent information systems were adequate because they were equal to such management requirements. However, the increased complexity of society has pushed communities to become networks of a large number of complicated, highly interrelated service delivery and resource management systems. Thus, what each function and department now does in a local government throws vibrations across other departments.

A new style of management seemed necessary, one that took into account the local government as a whole. For the manager wishing to manage the organization as an integrated unit, a truly supportive information system designed to reflect this new management approach began to command the interest and imagination of forward-looking professionals.

## Inception of R&D Projects

In 1970, the six selected IMIS project cities embarked on an ambitious program, the research and development of prototype systems and subsystems which ultimately would be designed and tested for use by a large number of medium-size American local governments.

The broad set of goals undertaken by each IMIS project city team (each team composed of the city as prime contractor, a management consulting or computer software company and a university or research centre as subcontractors) included:

A rigorous R&D approach to learn how integrated information systems could be designed and operated in cities.

Extensive documentation to insure the transfer of concepts and products to other municipalities.

Development of procedures to insure privacy of data.

Search for the maximum degree of automation possible both for purposes of increasing municipal productivity as well as greater humanization in the

delivery of services.

Ways of embedding computers into governmental operations so that the data processed by municipal organizations could be used for management and planning purposes at all levels of government.

The IMIS projects, all of which will be completed soon, have registered varying degrees of success. They have, without a doubt, produced a significant amount of documentation which can be very useful to local governments seeking key solutions to the problems faced by rapid change and growing complexities of essential operations and management.[5]

## USAC Program Outputs by Project Cities - An Overview

The products of the USAC program include extensive documentation and computer tapes on over 50 major computer applications. These applications cover many public finance, public safety and public works functions. These products can be used as points of departure for many cities wishing to utilize the positive experiences of USAC cities in their own jurisdiction.

What are some of these positive experiences? The following USAC city projects have already demonstrated that the use of computers in non-traditional areas can have significant financial, administrative and citizen benefits:

Dayton, Ohio A cash management system enables the city to maximize its interest bearing accounts, estimating additional revenue of $300,000 per year.

Wichita Falls, Texas A property evaluation system permits a continuing assessment based on current market values. Benefit: more equitable sharing of tax burden by all taxpayers.

Charlotte, North Carolina An equipment management system promotes more effective preventive maintenance scheduling and more effective vehicle purchase and disposition: estimated savings of $50,000 per year.

Reading, Pennsylvania A centralized Permits Processing System reduces clerical and citizen effort in applying for and obtaining approval for all permits. Net effect is more systematic handling of permits and less citizen frustration.

Charlotte, North Carolina A fire dispatching support system provides firemen on the way to a fire with information on hazardous materials stored within the endangered location, of occupants who might have trouble

escaping from a fire, as well as other basic information to assist in fire suppression. Benefits include lessening the threat of injuries to firefighters and citizens and reduced fire loss.

Long Beach, California Automation of many police functions and manual records reduced the need to hire additional clerical staff. Benefit - cost avoidance of over $125,000 per year.

Cost savings such as those estimated above, as well as non-economic benefits, cannot be achieved without cost. The cost is not only in expanded computer facilities and staff but also in management and user involvement. The mounting complexities of local governments, however, are shaping an environment in which the increased use of computer technology as a major tool in improving management and operation seem clear and indisputable.

As a result of the comprehensive documentation previously described, many other local governments are beginning to take advantage of the work these cities have completed and are transferring modules to their own jurisdiction. By modifying and transferring these previously developed modules, local governments can save considerable time and money and can begin to take full advantage of module benefits. Several examples of successful IMIS Module Transfers are described below.

The City of Fresno, California has completed the transfer of five modules which were originally developed in Dayton, Ohio. These modules are the core of Dayton's Public Finance System. This transfer which is representative of a more difficult transfer required the reprogramming of all application programs. The Dayton System runs on a tape oriented NCR computer while Fresno has a disk oriented IBM Computer. Despite the fact that extensive reprogramming was required, the cost to Fresno was less than if they had started from scratch. Relatively few changes had to be made to the basic design of the system thus enabling Fresno to take advantage of Dayton's Design effort.

Minneapolis, Minnesota is currently in the process of transferring Charlotte, North Carolina's Police Field Assignments Module. This module which assists in the dispatch of police vehicles is the largest and most complex of the Charlotte modules. Charlotte estimates that the design, development and implementation cost exceeded $750,000 and took over three years. Minneapolis expects the transfer of the module to their city, of course, to cost considerably less, and it will take 12 months to implement. This level of cost and time saving is made possible because of similarities in the Charlotte and Minneapolis computer configurations. This particular

transfer is of interest because in spite of the complexities of the module, no technical assistance either from Charlotte or from an outside contractor was required. The Charlotte documentation was sufficiently detailed and comprehensive that it sufficed as the transfer vehicle.

Another transfer that has interesting characteristics is the transfer of Wichita Falls Geographic Base Index System (GBIS) to Garland, Texas and return. The module was originally designed in Wichita Falls as a batch system. It was transferred to Garland and modified to run as an on-line system. The cost saving to Garland even with their major modification is estimated to exceed $300,000. After the module was operational in Garland it was transferred back to Wichita Falls where it now also runs as an on-line system.

These examples just touch the surface of actual and potential transfers. The increased complexities of managing our modern urban centres will require increased use of sophisticated technology. Taking advantage of work already accomplished in IMIS cities can bring computer technology into the reach of many local governments and result in significant cost and time savings.

The USAC-IMIS projects were originally based on an approach that held that analyzing and meeting the information needs for operations should provide the basis for a system capability to meet general management and other needs. Previous approaches to meeting management information needs were usually based on an approach wherein attempts were made to define such needs and construct systems to meet them; frequently without effective linkage to regular operations. A consensus appears to be emerging that a compromise of these approaches is required. That is, an operations-based system is required, but one wherein management needs have been rigorously reviewed and reflected in the operations based systems.

## Conclusion

Certain political (in the broadest and best sense of the term) issues and characteristics are relevant to a full understanding of IMIS, the USAC-IMIS programs and projects, and their potential for broad adoption.

A fundamental and continuing issue relates to the distribution of responsibility among various levels of government for initiating, controlling and delivering different types of governmental services, and the attendant means, conditions, and sources of financing them.

The federal system of government in the United States has evolved under a constitution in which broad powers were vested in the national government by the states. Local governments are creatures of the states, who grant them express and implied powers, and charge them with certain responsibilities. As the nation's population and problems grew and concentrated in urban areas, municipalities substantially broadened the scope of services that they provided and the range of problems that they sought to resolve.

The size and costs of local governments rose dramatically. Their sources of revenues, tied largely to property taxes and frequently limited by state law, were relatively inelastic. The national government's sources of revenue were and are most elastic. It was determined by the national government that national revenues should be provided to finance a number of programs in urban areas. The number of special grant-in-aid programs for specific purposes rose to over 1,000 by 1970. The scope and frequency of direct relationships between the national and local government substantially increased. In the course of all this, there has been continuing debate as to which level of government should do what, which level should "pay" for it, and what the balance should be between tight controls and flexibility in performance of these programs.

Comprehensive and integrated local government information systems are affected by all of this for several reasons:

The responsibility for initiating comprehensive local information systems rests with the local governments. But, elements of such systems may be stimulated, required, or assisted through national programs.

Variations in the standards and requirements of various national programs sometimes make it difficult to construct coordinated local information systems.

The extent to which the national government should assist local governments, and the conditions of such assistance remains at issue at both the local and national levels.

Unlike many nations, the variations and relative independence of local governments in the United States mitigate against the establishment of standard, centrally developed, information systems for local governments.

Local desires to retain independence and avoid "interference" from the outside sometimes conflict with the views of people who believe that national government agencies should direct the details of local participation in nationwide programs in order to assure the wide and honest use of national resources.

## Notes

1 Material contained in a 1975 contracted report to the U.S. Department of Housing and Urban Development by Public Technology, Inc., Washington, D.C.

2 Urban Information Systems Inter-Agency Committee

3 Integrated Municipal Information Systems

4 U.S. Department of Housing and Urban Development, Request for Proposals No. H-2-70 for Municipal Information Systems (Washington, D.C., July 1969)

5 For a succinct discussion of project successes, and problems, see Barry S. Wellar, "The Urban Information Systems Inter-Agency (USAC) Experience: Some Lessons Learned". Discussion Paper B.73.21 (Ottawa, Canada: Ministry of State for Urban Affairs, 1973)

## Discussion of Plenary Session C - Intergovernmental Concerns

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The three papers presented in the session on "Intergovernmental Concerns" were diverse, and only incidently touched on common topics.

Kenneth Kraemer focused on the problem of transferring software technology and know-how between units of local government. He first noted in a recent U.S. survey of cities over 50,000 population and counties over 100,000 population, where of those responding, only 18% of the cities and 29% of the counties had transferred software applications in the previous two year period. Kraemer sees these percentages as indicating a low level of transfer between governmental units. However, it could be argued that these same percentages could be interpreted as indicating quite a high level of transference in a relatively short time period.

He then states that the usual explanation offered in the literature for low levels of transfer between units is a combination of human frailties and technical limitations. He suggests that a more basic explanation is that "it simply is more unclear who really benefits from applications transfers, and given this uncertainty, few potential transfer participants are willing to risk engaging in transfer without outside stimulus." The major thrust of the paper focuses on six popular but (Kraemer maintains) unfounded benefits derived from software transfer from one governmental unit to another. They are:

a) Transfer of computer applications prevents each government from having to "re-invent the wheel." Kraemer stress that this is not necessarily an advantage since the development of an understanding of EDP is retarded when personnel do not develop their own system.

(b) Everyone benefits from software transfer. He posits that since the installation of a new system is often unsettling to personnel it is questionable whether everyone benefits.

(c) Computer applications can be transferred and adapted for a fraction of the time and money needed to develop them in-house. Kraemer argues that many of the existing systems are, in fact, too complex and/or poorly designed to be transferred.

(d) Transfer makes software available at low cost. Kraemer believes that the history of technological transfers will not bear out this contention.

(e) Transfer is a way to get EDP very quickly. He argues that the evidence to date does not support the premise.

(f) Technical factors are the major barriers to software transfer. Kraemer maintains that the major problem is the nature of general systems which have inherent suboptimization built into their design.

In conclusion, it is argued that in order to maximize the advantages of transferring systems the in-house staff should have a basic expertise. Furthermore if there is to be a transfer of technology and know-how it should be of simple rather than complex systems.

Though Kraemer's general points may be valid it was considered controversial whether it was worthwhile to "re-invent the wheel" each time in order that an in-house data processing staff might have the satisfaction of working out a problem. Most units of government just do not have the financial capability to indulge in such a luxury. In the discussion it was suggested that an alternative would be to bring in a resource person in order to teach basic procedures to in-house staff.

The paper by Rod Symmes reported on a program initiated by the U.S. government in order to improve the capability of local governments to design integrated information systems. His paper supported some of the contentions made by Kraemer.

Though Kraemer argues that it is possible to successfully transfer the exceedingly complex systems developed by NASA to the private sector, the examples presented of transfer between cities are single function systems, e.g. police records, management systems, etc. Symmes fails to explain why the private sector is seemingly better able to transfer and adopt total systems than the public sector. An area worthy of exploration is whether there are factors inherent in a public bureaucracy which mitigate against the transfer and adoption of total systems.

Mr. Moffatt, a policy analyst with the Treasury Board, presents a conceptual scheme of the policy process which is used by the board in analysing policy. Essentially, information systems are most useful tools for program evaluation. Moffatt notes that the failure of many government programs is in the very evaluation of their effectiveness. He uses a cost-benefit approach which attempts to evaluate the ratio of discounted future benefits to discounted future costs. Implicitly he argues that local government should evaluate the introduction of EDP within a total framework. In short, will the overall advantages outweigh the costs? It would seem one could

use such a formula in order to determine whether to introduce a total system at the local level or to develop an in-house system. Moffatt cautions that while one necessarily needs to quantify benefits in a policy model, that quite often the benefits are qualitative and cannot be evaluated. Essentially this is the point made by Kraemer when he argues that one has to balance the benefits of introducing a system from the outside with the intangible benefits to be gained by a staff initiating and developing a total system in-house. Dismissing an evaluation of qualitative variables is perhaps premature. Though qualitative factors necessarily cannot be directly measured there are indirect indices which may offer a reasoned empirical evaluation of a qualitative variable. As an example, Moffatt maintains that the general welfare of society is not quantifiable. However, one can specify the quantifiable components which comprise the general welfare and then develop composite variables which indirectly measure what previously were qualitative factors.

## Role of Management As Seen by Management Function

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### Abstract

In describing and assessing the role of this "in-charge" function, a number of recommendations are made in the paper. Urban information systems need "appropriate" marketing, knowledgeable evaluation, sensitive and aware management, "single-stop" services, and skilled (not necessarily technical) managers. Facets at each level of government are explored.

### Résumé

La description et l'évaluation du rôle du "dirigeant" donnent lieu dans le présent document à un certain nombre de recommandations. Les systèmes informatiques urbains doivent faire l'objet d'une commercialisation "appropriée", d'une évaluation intelligente, d'une administration sûre et avisée, et ils doivent disposer de services "centralisés" et d'administrateurs qualifiés (qui ne seront pas nécessairement des techniciens). Ces aspects sont étudiés à chaque palier de gouvernement.

## Introduction

While the very existence of this Symposium may indicate that "we know a lot" about the application of information technology at the local level, my own experience with literally dozens of local jurisdictions is that we know least about the management function as it relates to making that degree of technology transfer, suitable to its local contexts, which maximizes the prospective net societal benefits. I refer to management at all levels of government, and wish to include private sector management as well. This does not mean that there are no cases of "successful" technology transfer at local levels, since surely several exist, or that no instances of good management exist - although, apparently, the latter is not even a necessary condition for the former. The potential benefits made possible by the new technology, regardless of the way it is managed, will often produce useful, effective results.

## Management Vis-à-Vis Other Functions

There is so little time and so much to say here that I hate to waste space on a caveat - but let me at least present one. I do not share with certain peers (for example, Robert N. Anthony) the view that "management" is a co-equal with other administrative functions, e.g., (strategic) planning, operations responsibilities, or what have you. I believe someone and/or something needs to be in charge - to make the final decisions about the overall level and share of resources to be devoted to achieving a set of objectives, which it (i.e., "management") is also responsible for defining, given a specific political context. It uses planning and sets into motion operations, to achieve these objectives. Its role is to be the one overall decider across time, space, resources, values, and external constraints and opportunities: There is no need to glorify "management" - but someone has to have this role.

## Management Responsibilities for Information Technology

Having said that, and knowing that most of you are already familiar with the literally hundreds of papers devoted to aspects of management of local jurisdiction information technology,[1] what can I best do with the remainder of my message here? To help

achieve what, perhaps, Dr. Wellar had in mind for this Symposium, I think it best to review with you my most subjective and judgmental biases about urban information technology management, and let my Symposium colleagues tell me where they agree, and where they do not:

(1) While the urban information system has had its super-salesman and some oversanguine promotion and overpromising, it is no different from most other fields of new technology innovation and diffusion. The typical underestimate (full-ultimate cost) factor in the sale of a new defense or space technology ranges from 300 to 500%. I imagine that we are dealing with a 100 to 200% underestimate factor in this field - that sophisticated public management should recognize it for what it is, an attempt to underestimate the cost so a potentially high benefit-cost technology will be more readily accepted by a public in increments of learning about it - and what it can truly produce and will really cost. Unfortunately, the dynamics set into motion by misstated cost-benefit expectations are ill-understood - and rarely bode well for urban, as opposed to defense and space technology. Underestimates hit too close to the grass-roots in the urban field.

(2) Apropos is our lack of learning from current urban information systems elsewhere and everywhere. We are getting better at urban information system evaluation - but the federal and regional (or provincial) knowhow and leadership required above local levels is typically lacking in these ways: (a) to insist on finding out what "pays" and what does not; (b) to determine when social net benefits sufficiently exceed net private benefits to warrant public intervention; (c) to provide urban information technology technical assistance to local jurisdictions of a management and not strictly technical nature, out of a well-grounded assessment of what works elsewhere and why; and (d) to help establish evaluation systems of sufficient uniformity and depth so that results are transferable and we can understand the conditions whereby some things work and others do not. We know now that evaluation systems need to recognize the interim as well as ultimate achievements of programs set in motion, that results take time, that institutional processes are established which are part of the product to be evaluated, and that a variety of technology transfer models exist - none of which is necessarily "correct" for all situations. Such knowledge - sensitivity to the complexities of evaluation - are crucial to increases

in "know-how."

(3) Local management needs to understand, better, the multitude of objectives present in designing and implementing these technologies. Management needs to understand its own attitudes and become more supportive, less condescending, less recriminative, surely. A local functional area or information system manager needs top-level support in making his decisions, choices, estimates, and gambles. He needs supportive toplevel information, guidance, and direction - not what often occurs: "I told you so. It wouldn't work." (Does top management really say this - and out of what knowledge?) There are enough mutual local level goals - e.g., to make the most out of whatever the local setting contains relative to other jurisdictions, to reduce the cost (or raise the quality at the same cost) per unit of delivered services, to perform a service citizens wish to receive but could not before the introduction of the new technology. And where top level and subordinate objectives and subobjectives may differ, they should be clearly recognized, understood, and used to best advantage: how can they become mutually supportive - if not immediately, when? Multiple objectives are with us - management needs to learn better how to use them. After all, information is mostly a derived demand, is rarely wanted for itself - at least, in higher-level management views. This means that improvement in the service rendered - is more often where the action is taking place, and what "management" is seeking to assist through the new technologies. And information technologists must recognize the existence of other technologies - some competing, some complementary - and appreciate management's role in making hard and frequent choices.

(4) "Management" needs to define its information-technology role - at each level of government - clearly and explicitly. It can and should have several functions, but it must be wary of conflicts of interest. Federal level management can "evaluate" or help establish evaluation systems and transference of knowledge or help provide widely useful R & D products - but then it is less likely to be able to provide, out of the same (federal) shop, supportive technical assistance. (Models of joint federal level evaluation and technical assistance programs do exist, however, and should be reviewed for applicability here.) At the local level, "single-stop" (central focus) task force arrangements for coordinated, relatively fast action, service regarding local information technology decisions

need to be established, at and by the very top local public management level - for key decisions regarding standardization, promotion, hardware and software selection, budget approval, data access review, confidentiality and privacy decisions, information manpower (management and technical) training and development, and overall program direction and focus. I have seen this central guidance work at the local level - less related to the particular shop it is out of than the key individuals involved, the level of support provided by top management, and the patience and duration of this support. It can and does work.

(5) Management needs to be constantly aware of the changing political, socio-economic, and attitudinal environment swirling about the local jurisdiction, and the impacts which changes in the surrounding conditions can bring for local level information systems. Rapidly changing expectations, coalitions of the right and left regarding privacy and confidentiality, competing budget alternatives: these should not be hidden from the day-to-day information system designers and implementers. They need not be coddled. Like anyone else, they must learn to appreciate when slow-down (or even temporary shut-downs) is the order of the day - and when rush and immediate output requires perhaps even "hurry-up" expenditure. Again, mutual and supportive objectives are the order of the day - openly stated.

## Conclusion

Let me conclude my biased observations with this one: Management in this field of endeavor, like all others, requires some knowledge of the technologies and systems in question, but also a good deal of management know-how and application. There is considerable management experience in the field already. We need to learn from the exemplary instances, and fom the not-so-exemplary ones. Perhaps this Symposium is a good place to begin to pool these management lessons - which most of us have seen, experienced, and have not forgotten.

## Note

1 A multitude of case studies; much about anticipated and actual "results" and the incidence thereof ; several devoted to institutional forms (e.g., geo-utilities); dozens of illustrations about how and what needs to be evaluated; others devoted to "how to market, obtain resources, and promote"; several to intergovernmental relationships; and others to total data base management: an annotated bibliography itself would be very useful and would, itself, require an entire full-length manuscript.

## Role of Management as Seen by Management Function

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### Abstract

This paper suggests that the advantages of large urban data bases have been very much exaggerated, and explores why this has happened. It proposes that synergism in urban information should not be sought through large data bases systems, but through regular publication of a directory of urban data development.

### Résumé

Le présent document met en lumière le fait qu'on a beaucoup trop vanté les avantages des grandes bases de données urbaines et tente de découvrir pourquoi cela s'est produit. Il propose qu'on devrait viser à la coordination de l'information urbaine non par l'entremise d'importants systèmes de données, mais bien par la publication régulière d'un annuaire sur l'évolution des données urbaines.

## Introduction

Over the past few years, many analysts have urged the creation of large urban data bases, claiming that such data bases will not only improve decision making at the local level, but will also enhance local democracy by making information available to a wide spectrum of users. Attempts to produce such data bases, however, have met with limited success. Today, I would like to:

(1) Show that the advantages of these monolithic data bases, as regards improvements in both decision making and information sharing, have been very much overrated

(2) Try to explain why the advantages claimed for these data bases have been so exaggerated.

(3) Suggest a different approach to the evolution of urban information.

## Data Bases as Instruments for Decision-Making

Taking the first part of my first point, I believe that EDP support of decision making at all levels of government has been overstated for two reasons:

(a) It is not possible to design an EDP system to give answers in the political arena. EDP systems are of value where a large number of similar types of decisions have to be made. But most political decisions are unique in that each must be made in the context of current public opinion, while public opinion is notoriously fickle and never clearly articulated. Moreover, in a pluralistic society, many decisions must be made on the basis of preserving consensus rather than pursuing a particular policy to its logical conclusion. This particularly applies at the local level, where there are no political parties and therefore many policy decisions are made by coalitions of interests brought together for a single decision and for that decision alone. In the political process, the issues frequently only become clear during the process of making a decision; it is too late then to implement an EDP system to address the issues.

(b) Most political decisions are based on relatively few considerations and therefore can be evaluated without access to masses of data. The fact that all urban problems are interrelated does not mean that all aspects of a city must be

taken into account in making every decision. In any decision, various considerations will be far more important than others. While third and fourth order considerations may be many, first order considerations are typically few and are usually persuasive enough to render analysis of lower order considerations unnecessary. Even where lower order considerations are relevant, they can often be ignored because any adverse effects of the present decision can, if necessary, be rectified in subsequent decisions.

In sum, I believe that most decisions at the local level can only be made on the basis of timely specific analyses of the issue at hand, not as the result of complex computer juggling of masses of data. This does not mean the computer is irrelevant to urban governance. On the contrary, it is extremely useful, but only where the same type of decision has to be made routinely on the basis of the same type of information, e.g. issuing of building permits, design of traffic flows.

On the second part of my first point, I believe that the relevance of EDP systems as means to supply information to the public, and thus to enhance democracy, is overstated for two reasons. Firstly, I believe there is a fundamental misconception about what the public wants. The public has too much information available to it, but not enough analysis. People are striving not for access to the data banks of the world, but for the briefing documents which contain analyses on which decisions are made. Secondly, I believe the economies to be gained from such systems are overstated. This is partly because of the cost and time factors involved in coordinating and setting up data and associated hardware. My own experience in supplying data suggests that a great deal of explanation has to be supplied along with that data. Consequently, systems of information supply have to be augmented by technical advice, or run the risk of misinforming rather than assisting the public. This being so, the economies of automated information supply become extremely questionable.

**Bases of EDP Oversell**

Turning to my second point, if EDP monoliths have little to offer in terms of decision making and informing the general public, why is so much emphasis placed on them?

From the point of view of local government officials, I believe part of the answer lies in a highly understandable desire to use as modern methods as possible. Doubtless too, local government aspirations in this area have been assiduously cultivated by experts with hardware, software and consulting services to offer.

However, much of the pressure for information technology at the local level of government has come not from local officials, but from senior levels of government and from researchers and consultants. It is my belief that these people are not so much interested in data bases because of their effects on urban governance, but rather because they hold the promise of providing large amounts of data. The value of such data to local government has, I have suggested, been overrated. But it would be difficult to overrate the value of such data to other users. It is, after all, the lifeblood of government bureaucracies, the sine qua non of Ph.Ds, and the alchemist's elixir of the consulting industry. It is, I submit, at least partly for their own benefit that these groups have encouraged local government to adopt large data bases. This hypothesis would account for:

the dichotomy between the potential and actual benefits of EDP at the local level;

differences of opinion between local officials on the one hand and senior levels of government and researchers on the other hand about the development of EDP in local government;

massive amounts of money being spent by senior levels of government to seed data systems at local government which were abandoned shortly after the money ran out.

## A New Management Perspective for EDP Evolution

This iconoclastic view of EDP systems at the local government leads to my third point: a new management perspective for EDP evolution at the local government level. What the analysis (if that is the right word) suggests is:

(1) Local government officials:

(a) should forget about synergism and all supposed economies of scale in data production, and get back to thinking of the computer as a tool, to be used

for specific purposes, mainly unrelated to policy, in those instances in which it can be proven to do the job quicker, better and/or cheaper than other methods;

(b) should not predicate EDP development on such nebulous concepts as 'providing data as inputs to policy for different departments'. If a single department cannot justify an EDP project itself, it should check regular users of its data to see if they are prepared to contribute sufficient funding to make the project viable. If they would like the data, but are unprepared to provide the funding, then the project should be aborted;

(c) should not, above all, take a holistic approach to EDP. Individual projects should be undertaken on a piecemeal basis as they prove themselves viable. Coordination of concepts, software, hardware, programming, etc. should be maximized through creation of a central EDP development facility in house, or through use of an EDP coordinator, or by channelling all work to a single outside EDP firm which is equipped to handle the coordination aspect.

(2) Senior levels of government and researchers:

(a) should collect urban data themselves rather than try to induce local governments to do so. In developing urban data systems, the same rules apply as those for local government;

(b) should seek to avoid duplication of effort by funding some means to document all urban data development. The best way to achieve this would be through regular publication of a directory detailing what data exists where, whether on EDP or not, its availability, etc. If the real demand for urban data is anything like the reputed demand, then such a directory would be a self-financing proposition. If such a directory were to be developed, it would provide an excellent basis upon which to investigate possibilities for step-by-step development of common concepts in data, and simple transfers of data and systems between different local governments and other organizations. Achieving economies of scale by this method would not be quick. However, the costs involved would be miniscule in comparison to holus-bolus development of information monoliths. Moreover, there would be far greater surety of long-run success. This procedure is very similar to the process used with great success by Statistics Canada to generate comparable local government financial data across Canada.

## Conclusion

I believe we have become bemused by the potential of computers. Far from regarding them as simple tools, we see them as sirens beckoning us with shining visions of a democratic nirvana in which political decisions will not only be perfect, but will be seen instantly as such by all. Let us ignore these sirens. When computers do not fulfil this hopelessly unrealistic promise, let us not hold seminars and publish papers to bewail the disappointments which are the inevitable lot of those striving on the knife edge of technology. Let us remember what computers are. Synergism, like any other abstract virtue, if it exists at all, will not be found by frenetic researchers tripping over each other's computer printouts. Rather, it will be found by each person in each organization striving toward realizable goals with tools which either exist or can be readily and realistically developed.

# Role of Management as Seen by Operations Function

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## Abstract

The prime requirement is for management to realize that provision of information systems services requires, especially in the design phase, extremely close cooperation between information systems experts and operations experts. The usual client-service relationship is not adequate. This paper outlines the main principles involved in developing such a management approach.

## Résumé

L'administration doit absolument se rendre compte que la mise sur pied de services informatiques exige, spécialement lors de sa conception, une collaboration très étroite entre les informaticiens et les experts en opérations. Le rapport traditionnel client-service ne suffit plus. Le présent document trace les grandes lignes de principes permettant la mise au point d'une telle approche administrative.

## Introduction

A speaker's role at a session such as this is to provide a framework for discussion and to provide a point of view. Elaborate explanation and documentation of the views stated is unnecessary. For that reason, I will attempt to provide some definitions and two alternative situations which I believe highlight the most important aspects of management questions in the area of information systems. Finally, I will provide a summary of my views by providing a list of principles.

## Definitions and Contexts

Views differ as to the appropriate scope of the term "information technology". For present purposes, I believe, it is preferable to use a fairly narrow definition. It includes:

computers and peripheral hardware;
operation and maintenance of hardware;
data management (input, output, storage and documentation);
data management software;
data analysis software; and
model operation software.

Therefore, all use-specific software beyond this, such as developing the models and data for operations usage are part of operations functions. And certainly not all that is denoted and connoted by the term "management information systems", is included.

The term "management" is used in two senses in this discussion. First, the term "management" is used to refer to senior management. Senior management is responsible for organizational structure and for broad allocation of resources and activities. In the first sense "management" is a small group of people. Second, management is the activity in an organization of deciding at all levels of detail on the allocation of resources, the design of systems, and the operating procedures of the entire organization. The context in which the term "management" is used should identify the appropriate sense.

Finally, an operations viewpoint is the view of staff in an operations unit utilizing information systems services and/or facilities. Two fairly distinct types

of operations functions should be defined. First, the operations function may be provision of services to an external client. Second, the operations function may provide staff services, especially management advice.

**Relationships among Functions and Allocation of Management Responsibility: External Client**

In this case, the basic functional structure of the organization is a management function, one or more operations functions providing a service to external clients and an informations systems function, providing services to the operations functions. The problem is to identify the appropriate allocation of management functions in the area of information systems. Which aspects should be decided by "information systems" staff, which by operations staff, and which by senior management.

There are three broad approaches that may be used in such a case. First, given the terms of reference established by senior management, information systems staff may develop the systems as they think best within the terms of reference. Senior management rarely would have the necessary knowledge to provide appropriate terms of reference for system design and, unless the operations functions require only the most standard services, there is every likelihood that the design will fail totally. This approach was included for completeness. Hardly anyone would recommend such an approach today.

A second approach, call it the "survey approach" has many advocates. Senior management, within only extremely broad terms of reference, requests information services to provide the broad design based on a survey of user requirements. Even if done well, this approach, while unlikely to fail totally, will fail in part. Except in provision of standard services, the surveys approach will not provide enough information for detailed systems design.

The final approach, joint operations-information systems design is one that provides the maximum odds for success. In this case operations and information systems staff jointly design the required system. Because both groups must learn a good deal about the other group's activities, the design phase will be much longer. Nevertheless, a usable product is much more likely. Even this approach cannot be expected to work perfectly. Only practical experience and adoption of a software system over time is likely to provide an entirely satisfactory service.

In situations where there is more than one user for basically the same system, two approaches exist. First, unique systems for each user are developed. Then, information systems may merge the activities on its own providing no user notices the change. Second, all the users and information systems together serve as a task force to design the system as described in the last of the three options described previously. The best approach in most cases is to begin with single client-specific systems. Of course, there may be cases where the economies of beginning with a multi-purpose system are too great.

There are several other questions of specifics that could be considered, but the general principles that I advocate are apparent.

> Multi-purpose systems should only be started from scratch as an absolute last resort. Multi-purpose systems should be developed from related single-purpose systems by information systems without user consent so long as the users of single-purpose systems are not adversely affected.

> Design of single-purpose systems should be carried out jointly by Information Systems and Operations staff.

### Relationships Among Functions and Allocation of Management Responsibility: When Operations Is a Staff Function

Specifically, I am thinking about a staff function that provides advice to management. This is an especially difficult area because typically the information requirements of management fluctuate rather rapidly, and managers are notoriously bad at specifying their needs in anything like a useful manner. I have long since given up complaining about this situation and, I believe, everyone else in information systems or staff operations functions should also.

Alternatively, senior management should assure that the senior professional operations staff have as much contact as possible with senior managers and be well informed on the nature of issues they face. In this way, operations staff can serve as the translators of management information needs, in a form usable by information systems management and professional staff.

If the process as described does not work, then the organization, in all likelihood, has the wrong people in certain key positions. This means that all surveys of senior

managers, all requests for specification of directions from senior management are likely to be useless or even counterproductive.

The relationships between operations and information systems functions remain approximately the same. The main difference is that now both sets of staff, operations and information systems, must be especially sensitive to building systems and procedures that are flexible.

Therefore, in addition to the two principles in the preceding section, two more principles can be added:

> For staff operations functions, management should assure a high degree of professional staff contact and familiarity with management issues. Ideally, heads of staff operations units should be substantially capable in the operations area, as well as management.

> For information systems related to supporting staff operations functions, flexibility should be accorded a high priority.

### Summary

My views on the role of the management function informational systems are summarized in the following four principles:

> Multi-purpose systems should only be started from scratch as an absolute last resort. Multi-purpose systems should be developed from related single-purpose systems by information systems without user consent so long as users of single-purpose systems are not adversely affected.

> Design of single-purpose systems should be carried out jointly by information systems and operations staff.

> For staff operations functions, management should assure a high degree of professional staff contact and familiarity with management issues. Ideally, heads of staff operations units should be substantially capable in the operations area, as well as management.

> For information systems related to supporting staff operations functions, flexibility should be accorded a high priority.

# Role of Management as Seen by Planning Function

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## Abstract

This presentation focuses on the "soft" elements of information technology and its application for municipal goverance. It discusses the difficulty of developing integrated systems within the organizational framework of municipalities. Taking the planner's viewpoint, it describes the difficulties which the planner must overcome in order to impose planning interests on the design and development of information systems. Finally, it concludes by describing the "fundamental need" to carry out comprehensive, formal needs analyses before implementing systems; these must consider "the supply and demand" for information within a formal set of "efficiency and effectiveness" criteria for systems design.

## Résumé

Ce document porte sur les éléments "souples" de l'informatique et leur application à l'administration municipale. Il traite de la difficulté de mettre au point des systèmes informatiques intégrés dans le plan d'organisation des municipalités. Il présente les difficultés que doit surmonter le planificateur pour susciter de l'intérêt à l'égard de la conception et de l'utilisation des systèmes informatiques. Pour terminer, il insiste sur le "besoin vital" de mener des études précises et approfondies avant de mettre sur pied de tels systèmes; ces études doivent tenir compte de "l'offre et de la demande" d'information et répondre à des normes "de rapidité et d'efficacité" en ce qui concerne la conception des systèmes.

## Introduction

In order to place this presentation in context, management information systems are herein defined as "a structured set of procedures for collecting, storing, analyzing and displaying information required for the management and planning of large-scale, complex organizations".

We must be careful to avoid naive impressions of management information systems. Many people believe that any information, record-keeping process is a management information system. (That may well be true, but only insofar as areas of the management sciences are enshrouded in terminological rhetoric.) Also, we should avoid associating management information systems with computer systems, or any other automated process for collecting, storing, and displaying information. Rather, our understanding of management information systems should focus on the efficiency and effectiveness with which information is collected, stored, analyzed and displayed in order to assist the managers and planners in organizations. In particular, how is the information used for decision making?

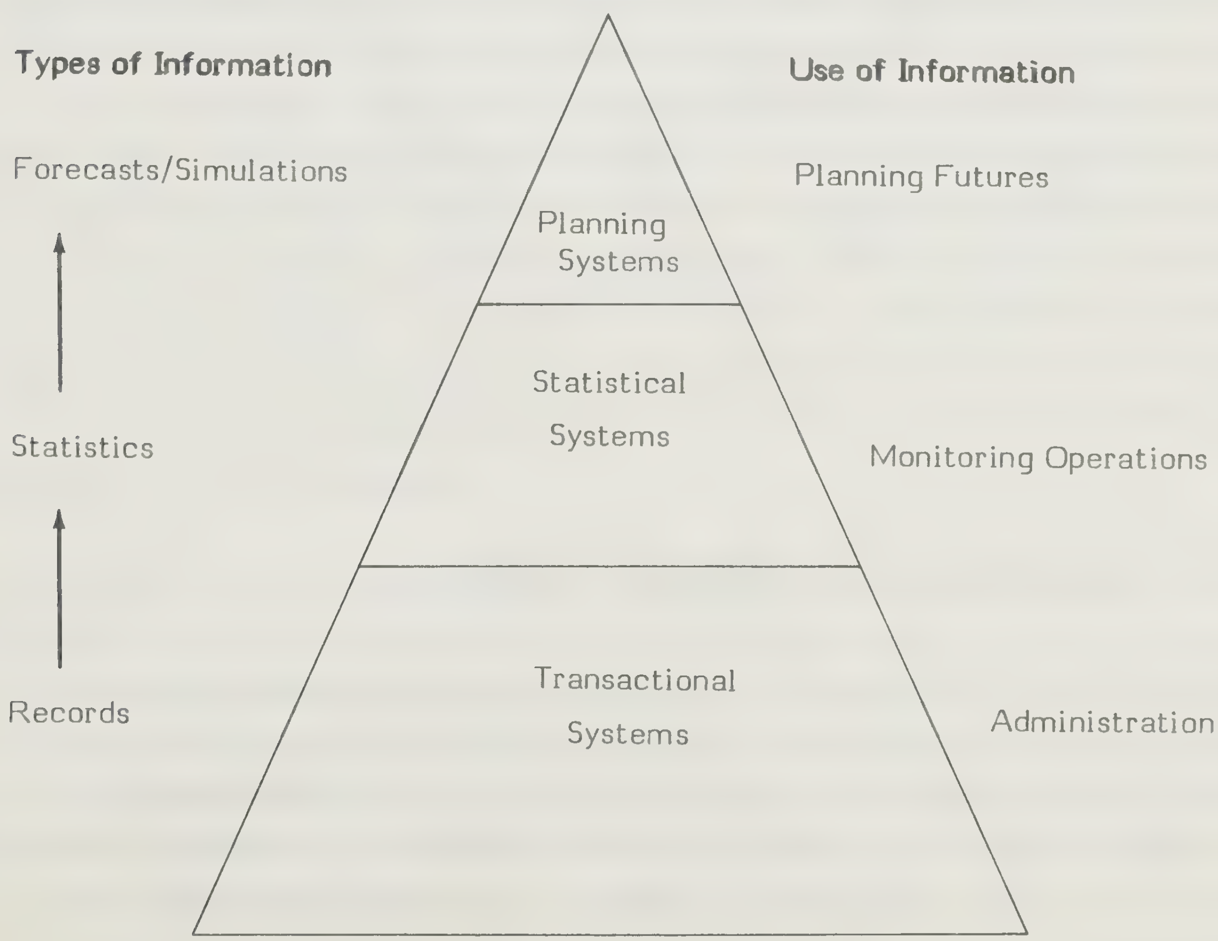


**Figure 1** The Information Pyramid

## Components of Comprehensive Information Systems

The simple schematic chart shown illustrates the interrelationships between components of comprehensive information systems and, at least implicitly, enables us to examine the concepts of efficiency and effectiveness in the development of management information systems. We have conceptualized the information system as a pyramid. The base of the pyramid is comprised of transactional information subsystems, designed to collect, store, and display records on the operations, and to assist administrators who manage the agency.

At the next level, we have statistical information systems. These are usually derived from the transactional systems, since a statistic is either a ratio or involves some measure of a record over time. Statistics are used by managers and planners to monitor the operations of an organization.

At the top of the pyramid, we have planning information systems. The substance of these systems are statistics, structured so that they may be used for both current analysis of the organization and either forecasts or simulations of the organization in the future, under different conditions of operation. Planning systems are usually called models; their intent is to replicate the characteristics of the organization and provide a convenient method for objectively studying the organization under different conditions of operation. During the last decade, we have seen many examples of urban simulation models designed to assist urban planners with transportation, financial and land use problems. For example, the Ministry of State for Urban Affairs has been developing a model known as MUPIM. It is designed to provide a total, planning information base for analyses of transportation, the urban economic base, demographic factors, and household and housing determinants.

## Effectiveness and Efficiency in MIS Design - An Elaboration

Let me now turn to the question of efficiency and effectiveness in management information system (MIS) design. The efficiency question relates to the ability of the MIS to capture and manipulate information on a cost effective basis. It costs a great deal of money to build and maintain management information systems. In the social and economic domains, management information systems can only

be justified if each individual item of data is considered an asset and the system is planned to make maximum use of these assets. We must plan the systems to be integrated. Transactional systems designed to store record-oriented information, must also be designed to provide the substance of statistical information systems. Similarly, statistical systems should be planned with a view to both providing information for monitoring of operations and providing inputs into the planning models required at a different level of the organization. In order to assure cost-effectiveness in MIS design, it is necessary to build the systems from an integrated standpoint. This requires unity of design.

The question of effectiveness in MIS use is similar to that of efficiency, and once again we turn to the information pyramid to illustrate the issues. An information system should be designed to provide timely information to each level and function of the organization, relative to its responsibilities and objectives. Generally, each of the three levels of information on the "pyramid" supports a different level of management. Transactional information systems support administrators through the maintenance of records for line responsibilities. Statistical systems support both administrators and planners by providing a statistical perspective on the operation of the organization. Finally, planning systems support planners who use models to recommend future resource allocations. The effectiveness question relates to the ability of the "system" to provide adequate information for these purposes. Finally, the information should be provided within efficiency constraints, established by the organization's ability to support the expensive information systems.

### Integrating Information Systems

The ideal information system for any complex agency should be integrated, in order to reap the best information benefits for all users, while making the most intensive use of information collected for support, record keeping purposes. Yet, few information systems are planned with this in mind. Invariably, the process of information system design is fragmented,and subsystems are developed on an ad hoc basis. There are two major impediments to the development of an integrated information system for most organizations, i.e.:

Information systems are usually controlled by managers responsible for the provision of computer services. Consequently, the development of the system is confused with the need for computer hardware and software. By virtue of their personality and their vested interests within the organization, these people are more interested in making use of the computer than developing an economic and effective means of manipulating information. As a result information systems, and incidently, the use of computer hardware, are justified for their utility in the record keeping/ administrative function. Payroll systems are developed before personnel management information systems, even though most large agencies would be better served by letting the banks support their payroll operations and devote internal resources to the development of personnel systems.

Because of the association between management information systems and the operation of the large, usually expensive computer configuration, the control over management information system development is usually placed in the hands of managers/administrators. Planners interact with this organization as second party users of information. In many instances, there is little rapport and joint planning in the use of these resources. Also, planners must be satisfied with system modules which were not really developed or structured for planning purposes. Every time a new operating or transactional system is developed, it is patched on to the existing systems at the administrative level, without adequate consideration for planning needs.

Planners are therefore left at the tail end of information system design. If they wish to develop planning models, they must satisfy themselves with expensively derived statistics and coefficients from transactional and statistical systems which were designed for different purposes. Thus planners are put at a competitive disadvantage in their influence on the direction of the organization.

## Conclusion

I have spoken about the development of management information systems from the perspective of the planner. I'm certain that equivalent, perhaps even stronger arguments can be made from the perspective of the manager/administrator. But that is not the real issue; it is, rather, the need to develop effective and efficient

information systems for public agencies which must cope with an increasingly complex and threatening external environment. Although information systems should not be considered as a panacea, they can certainly contribute to the ability of the public agency to provide a more effective public service to the population.

There is no simple solution to the organizational conflict regarding the operation of management information systems. One generic recommendation seems obvious. A great deal of attention must be devoted to the identification and cost-justification of information needs in all complex institutions. Given the way information systems are usually built - piece by piece, in urgent response to immediate needs - most organizations have evolved something far less than efficient and effective information systems. Every organization should conduct a periodic review of its management information needs - perhaps on regular five year intervals. The information needs study should involve all senior managers and provide a vehicle for bringing together the disparate views of line managers and planners.

I am convinced that a periodic total MIS review, costing nickels and dimes for any organization spending considerable sums and maintaining expensive information systems is the best, cost-effective investment the institution can make.

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## Abstract

This paper presents a municipal planner's observation that information systems in local government may not reach their full potentials because the municipal manager, for a number of reasons, generally does not and cannot incorporate formal evaluation processes within a municipal administration. Also, with apologies to Dennis Lee, this paper presents an ... "Alligator Stew".

## Résumé

Le présent document fait part des remarques d'un planificateur municipal: selon lui, les systèmes informatiques des administrations locales ne peuvent se développer complètement parce que, pour plusieurs raisons, l'administrateur municipal ne met et ne peut mettre sur pied de véritables modes d'évaluation au sein d'une administration municipale. Enfin, avec toutes les excuses que je dois à Dennis Lee, le présent document se présente un peu comme un "pot pourri".

## Introduction

During the course of this paper I am going to discuss a topic assigned to me by Barry Wellar. I have rephrased the topic as follows: "A Planner's Observations about How the Municipal Manager Performs in Seeing to It that Information Needs Are Met within Municipal Government". I am purposely going to be brief in my presentation, so that I may draw your attention to the key points that I wish to call to your attention. The topic at hand is really a stew, or goulash, or soup. There are four basic ingredients which I would like to put into our stew initially. These are:

1 Economists do it. Planners do it. Systems analysts do it. But do managers do it?
2 Roles of the manager.
3 Fog.
4 Alligators.

## Elaboration of Ingredients

Let us look, in turn, at the ingredients of the stew. It is not my intention to concoct the stew at this time, but rather to discuss selected aspects of those items which I perceive to be among the tangier elements.

Economists do it. Planners do it. Systems analysts do it. Engineers do it. Personnel directors do it. Even clinical psychologists do it. But, do municipal managers do it?

The answer to this question is: I don't think so. What is it that all of the operatives that I have mentioned on the municipal scene do that the municipal manager doesn't do? Any ideas? Economists have been looking at costs and benefits for years. Planners have been heavily involved with objectives, alternatives, and with performance and impact. Systems analysts are steeped in decision theory and, of course, systems analysis. Personnel directors set up job descriptions; they outline job functions and objectives as well as qualifications. And they set up criteria for evaluating applicants. As to the clinical psychologists "doing it" I must say that it was a

revelation to me this past fall, in participating in a seminar on communications, conducted by a clinical psychologist, that the clinical psychologist speaks of problem identification, generation of solution ideas, postponement of selection of solutions, and evaluation of possible solutions.

But enough of what I've just been talking about - suffice it to say that many professionals are trained and experienced and have to operate, day after day, using a whole bundle of skills embracing the setting of objectives, the identification of problems, the explicating of numerous solutions or courses of action and then evaluating such solutions or courses of action in terms of, say, performance and impact. In a word many, many professional operatives have an outlook which I will for simplicity call an evaluation outlook. I must admit that I have only crudely expressed the notion with which I am sure you are all quite familiar.

In summary, my point is that economists, planners, systems analysts etc. do it - that is they evaluate.

But in contrast to this I don't believe, as a general rule, that municipal managers do it. That is, I don't believe that municipal managers, as a general rule, evaluate. I'm not talking about the necessary casual or implicit evaluation that all of us must do. I'm talking about formalized systematic evaluation. I don't think that municipal managers are trained in this outlook. Also, quite often they may not be experienced in this important framework.

Please don't misunderstand me. I am not, as a municipal planner, blaming municipal managers for not "doing it" - for not evaluating in a formal way. I am merely describing a situation which I think may be true. I haven't done the research on the matter. And I must admit I have not searched the literature to see whether or not this particular question has been dealt with. I am simply supplying an observation.

There are, of course, many many reasons why the municipal manager doesn't formally evaluate. Lack of time, too many immediate questions, to few hours in the day, too many unexpected crises, etc., etc. All of these militate against the manager performing as an evaluator.

I have overstated the case, for emphasis. Certainly, some managers do evaluate - or see to it that what I have called the evaluation process is conducted within their administrations. But I would suspect that many municipal managers don't, and can't, "do it".

## Roles of the Municipal Manager

The roles of the municipal manager. What are the perceptions of their roles? By the manager? By others? How does the manager behave?

The manager, classically, sets objectives, organizes, motivates, communicates, sets standards, measures performance, etc. This is what the book says. The manager is quite often too tied up with day to day pressures to really do all the things required, to fulfil all the roles of the position. The manager, I suspect, only rarely would be, and could be, fully attentive to formal evaluation processes and therefore to information needs within municipal government - because the availability of the right mix of information is crucial to successful evaluation.

A number of points might be made in this regard. However I must simply close by saying it is quite conceivable that municipal managers tend to neglect an important technical or professional role - and this is what I would call a formal evaluation role.

So I have now added a second ingredient to the stew. That is, the roles of the manager.

## Fog

The next ingredient is fog. What I want to say here is that unfortunately we have to deal with things about which we have only a foggy notion of their real nature. I believe that oftentimes we are driven to indulge in things for which we are unwilling to make adequate preparation. It's easy to talk about and oversell the establishment of an information system (or "getting into MBO" or you-name-it). But the difficulties (including costs) of operationalizing an information system are often undersold. Disappointment and sometimes bitterness follow. To me the route of this type of problem can be found in foggy notions of the total nature of the matter at hand.

## Alligators

I want to close off this part of my presentation by adding one final ingredient to the pot. I am going to read a quotation which was on a bulletin board of the purchasing

department of a city I worked in. It's the usual bulletin board kind of material which people pick out of newspapers or professional journals - satires on bosses, efficiency experts, etc., etc.

> NOTICE
>
> The objective of dedicated company employees should be to thoroughly analyze all situations, anticipate all problems prior to their occurrence, have answers for these problems and to more swiftly solve these problems when called upon ......
>
> HOWEVER
>
> When you are up to your ass in alligators, it is difficult to remind yourself that your initial objective was to drain the swamp.

To me the municipal manager is surrounded by alligators - and it's these animals which make it very difficult to link management with planning with information.

## Conclusion

This paper sought to establish a context for examining the role of management from a planning perspective. In doing so, it examined the questions of evaluation, the burdens of management, problems of a difficult conceptual nature, and the continuing difficulty of reconciling what should be with what is, in an institution.

# Role of Management as Seen by Data Processing Function

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## Abstract

This paper sets out the three dimensions of the management function and demonstrates how the information system must relate with these aspects. It identifies the major shortcomings of management, and shows how these must be overcome. In taking steps to improve management there will be a consequential burden placed on the information systems function to provide improved information for various management purposes.

## Résumé

Le présent document présente les trois aspects de la gestion et explique comment les systèmes informatiques doivent y correspondre. Il met en lumière les principales faiblesses de la gestion et montre comment les corriger. Les mesures prises en vue d'améliorer la gestion auront pour effet d'imposer un lourd fardeau aux services informatiques, en les amenant à fournir des informations plus précises à diverses fins administratives.

## Introduction

In examining the management function, one can identify three main dimensions:

(a) The Program - which comprises the statement of program objectives, the specifications of what services or benefits have to be delivered, the definitions of eligibility for services or benefits and the specifications of the delivery mechanisms.

(b) The Operations - which refer to the actual implementation and execution of the program.

(c) The Market or Target Population - to which the program is directed.

The management function consists of acquiring information on all these dimensions and using it to integrate them and to maintain them in equilibrium. It requires information on operations aspects so that ongoing administration can be adjusted to take account of changing conditions or to eliminate shortcomings in the delivery system. Information is also needed on the effects that the program is having on the target population, and on those outside the target population so that the program changes needed to facilitate accomplishment of the objectives can be identified.

This then is the management function - a judicious harmonization of the three dimensions. Analyzing the management function in this way begins to reveal the importance of information through the whole management process.

## Evolution of Information Technology

Over the preceding three to four decades, information technology was concerned primarily with the acquisition and processing of data to generate statistical reports. With the development and increasing sophistication of electronic data processing technology, our ability to handle still greater and greater masses of data was correspondingly enhanced.

More recently, sophisticated econometric and policy models have been constructed which utilize the statistics being collected to try to explain and predict the behaviour of the national economy or various segments of the economy.

Despite tremendous advances in the ability to collect and process large masses of data, it was difficult, particularly in government, to utilize the resulting statistical reports to reach definitive conclusions about whether or not we were doing the right

things to meet the needs of the people, or to determine if the things we were doing were being done in the most efficient and effective way.

These weaknesses have led to the development of increasingly sophisticated techniques for evaluating the efficiency and effectiveness of both programs and operations. Thus, in more recent years, we have witnessed an increasing concern by management with the need to improve and apply evaluative techniques as a management tool. This focus has meant that there had to be an effective information technology to support the increased demands of these evaluation processes.

Now that we have reached this stage in the evolution of management and information technology, what are some of the shortcomings that we have to overcome to improve the management function, and as a consequence, the information systems function?

These include:

(1) A continuing shortage of skilled evaluators. This has resulted in an absence of positive direction for the information systems function.

(2) The management function itself is deficient in some respects:

it still tends to be input-oriented, particularly in government.

it is still predominantly crisis-oriented, so that information demands arise at the point of the crisis rather than being planned.

it still tends to be preoccupied with statistical reports, instead of specifying key questions it wants answered.

The consequence of these shortcomings is that, despite the growing mass of statistical reports available to management, it is becoming more and more isolated from what is really going on in the programs and in operations because it doesn't have the essential information.

## The Human Body as an Information Technology Analogue

To deal with these deficiencies, we can draw a lesson from nature. The human body is a perfectly functioning machine and can serve as a model from which guidance can be obtained.

The controlling mechanism of the body is the nervous system, which coordinates the various sense organs, glands and muscles. No physical or mental activity can take place without its intervention (Figure 1).

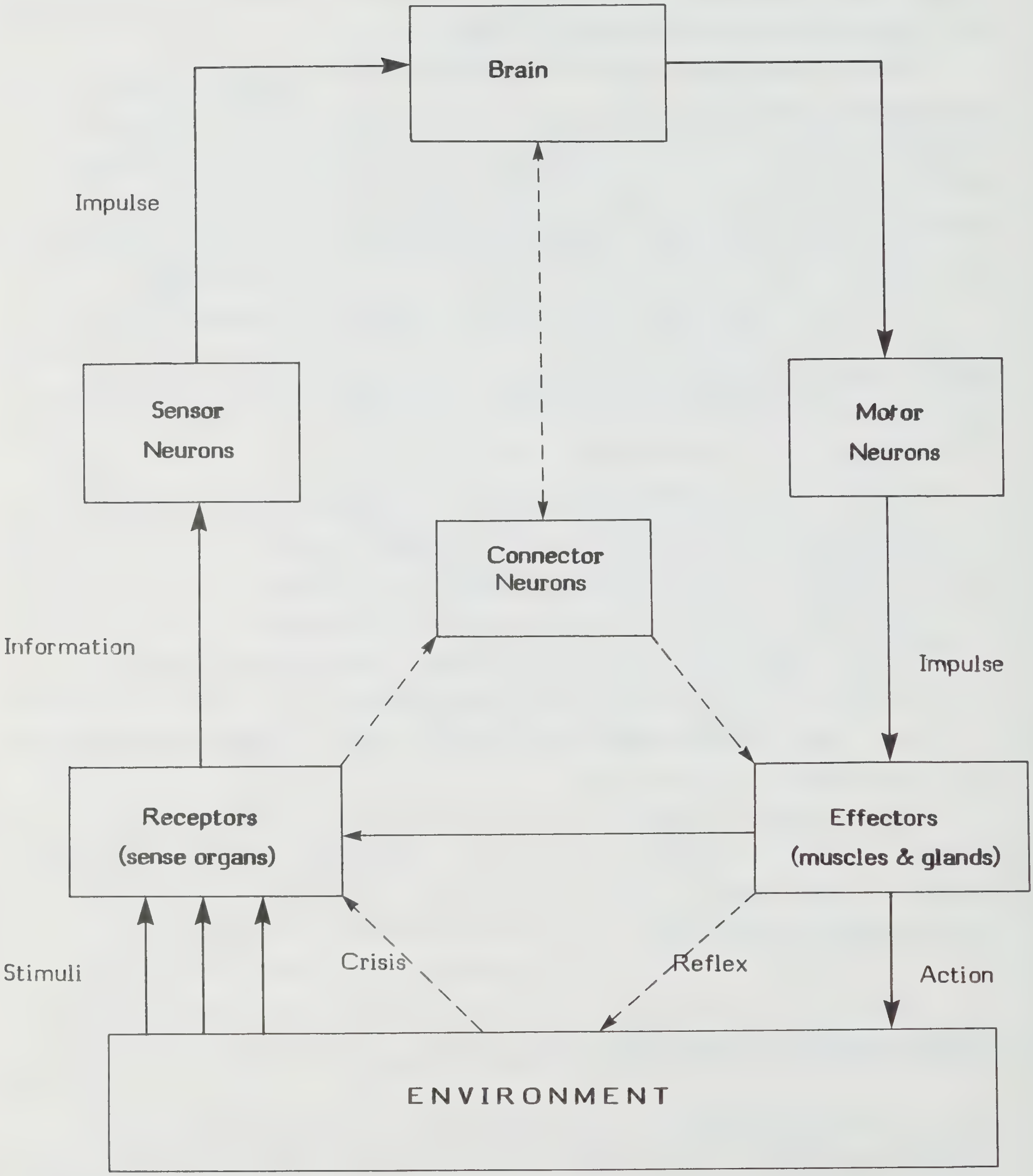


**Figure 1** Human Nervous System

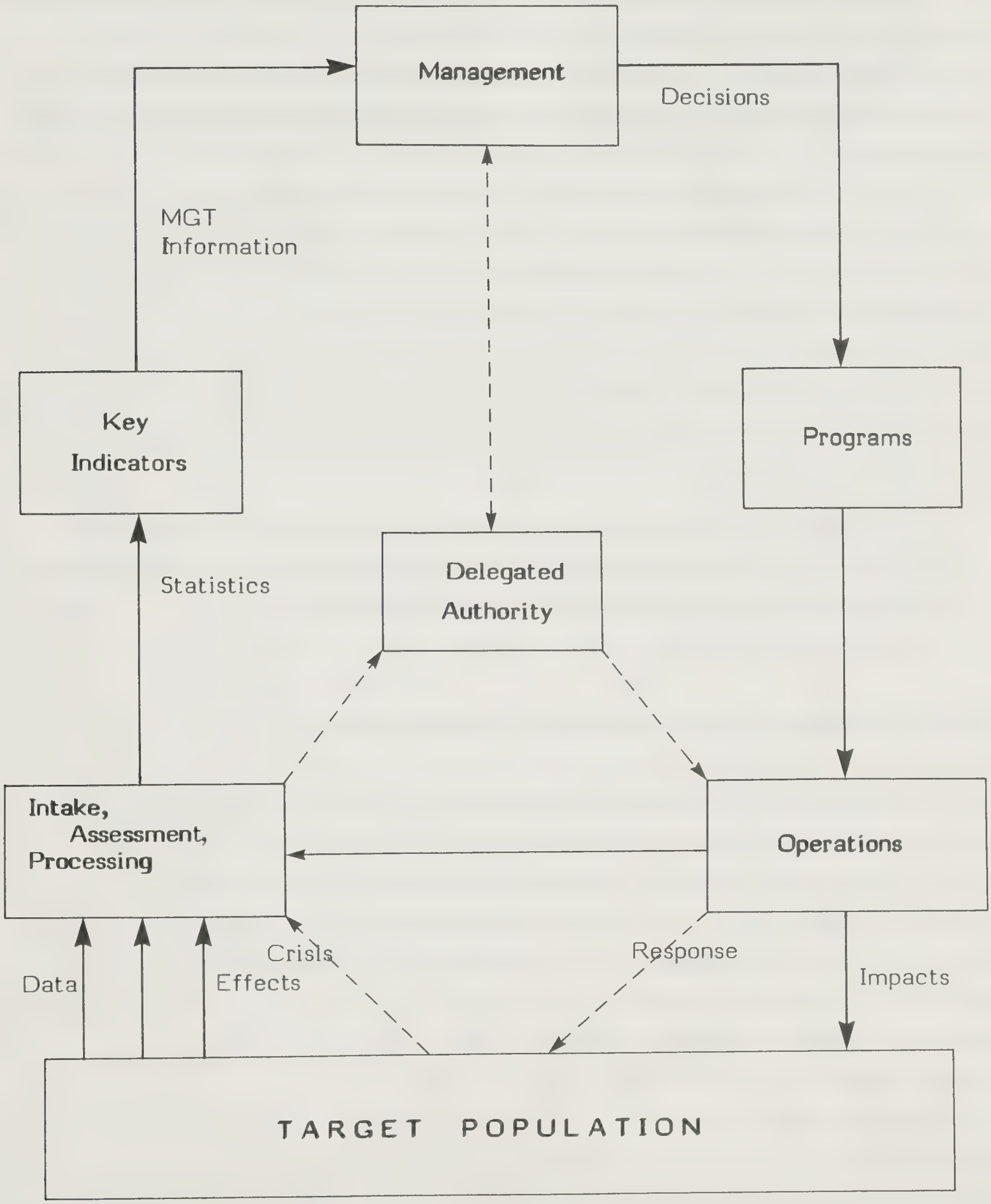


**Figure 2** Information Systems Cycle

The central nervous system serves to coordinate, connect and integrate all messages, incoming and outgoing, to and from the brain. It can thus be viewed as a vast communications network which receives energy from the environment and transforms it into signals that produce appropriate responses in different parts of the organism.

In examining this simplified model, one can see the information system implications. First, there is a multitude of random stimuli exerted by the environment on the various sense organs. This random and unorganized information is transformed by sensory nerve cells into a comprehensible signal - an electric impulse. This impulse is relayed to the brain where correlation nerve cells interpret the impulse and integrate it with other incoming messages. Once the messages have been analyzed and a determination made as to the appropriate action, the command is sent to the muscles and glands via motor nerve cells.

This model clearly suggests how information and information systems are an integral part of the management function, here represented by the brain (Figure 2).

What parallels can one draw from this simplified model?

## Rendering Information Technology Useful - Management's Role

First, management has to establish the main areas of the environment (its market or target population) by which it intends to monitor the progress of its programs and the effects of its programs. Like the human body, it may want to take action if a certain event occurs - this event could be analogous to the temperature dropping below a certain point. Management has to establish what these critical points are. It also has to develop a mechanism by which there is an organized inflow of information in accordance with the specified indicators. And, finally, this information has to be transformed into meaningful messages or reports.

Once these reports are received by management they then can be integrated with other information. Conclusions can be reached and decisions taken on the action required to make the program more effective or to ensure a more effective and efficient delivery system (or action).

Given that management has specified its needs, the information system can be developed to collect the data, process and analyze them and the resulting information can be reported to management in an organized and systematic manner.

## Conclusion

The preceding exposition has indicated how the management function has related to the information systems function in the past, and how the management function has attempted to cope with the issue of management information.

What are some of the directions that must be taken in the future?

(1) Managers have to actively support and encourage evaluation of programs and operations as a basis for finding out what is going on.

(2) Managers have to focus on outputs as well as inputs to determine how efficiently their operations are producing.

(3) Crisis-response has to become the exception rather than the rule.

(4) "Management information" has to be specified by management. It has to ask the key questions.

Given that the management function moves in these directions, it will, as a consequence, be placing additional burdens on the information systems function. However, it will also be providing clearer direction for that function, since it will be specifying with precision the questions to which it wants answers in order to manage its programs and operations.

These questions will in many instances require the extension of the information systems function to the local level, since this is where the "market" or "target population" to which many programs are directed is found.

## Role of Operations as Seen by Operations Function

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### Editor's Abstract

Two typologies of data systems are seen to exist in the Ontario government, an administrative system and a decision data system. The former is primarily of a day-to-day functioning of government or line operation nature, whereas the latter serves as a means to possible program modifications, and support to management for quality control and planning activities. From the point of view of the operations function, the utilities and capabilities of the two systems to satisfy their intended purposes are discussed.

### Résumé

Deux types de systèmes informatiques sont utilisés par le gouvernement de l'Ontario: l'un dans l'administration et l'autre dans le processus décisionnel. Le premier sert avant tout à desservir les besoins quotidiens d'information du gouvernement tandis que le second constitue un moyen d'apporter, s'il y a lieu, des modifications aux programmes et de venir en aide aux services de gestion pour le contrôle de la qualité et les travaux de planification. En se plaçant au point de vue de l'exploitation, on étudie l'utilité et l'efficacité des deux systèmes, par rapport aux fins pour lesquelles ils ont été conçus.

## Introduction

In general terms, two typologies of data systems can be considered to exist in the Ontario government. One is the administrative system, primarily concerned with the day-to-day functioning of specific programs including such things as the production of cheques or the cross-checking of individuals files. This system is often quite sophisticated as it involves rich interactions between legislation, programs, resources, administrative control, constituency pressures, and evaluation.

The second system is what I shall call the decision data system. This system draws its information from a variety of sources, including administrative files, etc. However, the emphasis is not so much on day-to-day functioning as upon possible program modifications. That is, the concern is providing data in support of staff as opposed to line operations.

The fact that several functions may be concerned with the same subject matter and analyses means that the same data, computer programs, and documents may have multiple uses. Consequently, the two typologies, administrative and decision data overlap one another to a significant degree. The goal of the latter system is to gather accurate information about services provided as well as characteristics of the persons served, aggregate this information, and produce reports useful to management for quality control and planning purposes. This goal statement is an articulation of the data support requirements of professional social planners, policy developers and decision makers. More briefly, it can be thought of as providing the statistical basis for government intervention in society.

### Data Needs Environments

There is hardly a user or group of users that does not call for increased quantities, and more timely or reliable data. For one thing, users in municipal and regional governments are attempting to build comprehensive planning capacities that are relying increasingly upon systematic data analysis. In contrast to the provincial government, municipal users are primarily concerned with small area statistics and structural, rather than trend, data on society. Universities, on the other hand, seem to want extensive historical data as a research tool to study economic and social behavior. Quasi-governmental agencies, such as Children's Aid Societies, Social Planning Councils, etc. are taking strategic planning approaches which are omnivorous in their capacity to devour data.

The broadening of provincial policy concerns has resulted in the creation of many new programs which, because of their newness are able to produce only a generalized data demand, not to specify their needs in the detail required by existing statistical processes. In light of the increasing complexity of the goals of government, both new and old provincial programs are demanding priority in the decision data system. Thus, the demands on the decision data system are both diverse and enormous.

Public policy decision making inevitably involves interrelationships between the various bodies and agencies of government and the multiple levels of government, and also the interdisciplinary dimensions of relevant knowledge, data and technique. However, the decision data system, as it has existed, has been grossly inadequate for the demands being placed upon it.

It is difficult to discuss provincial data systems in the context of the planning function, since most existing provincial systems are either irrelevant or, at best, incidental to planning. Certainly few (with a single exception which I shall describe later) have been constructed explicitly as planning tools; almost all have been designed as administrative systems to assist program implementation.

## Shortcomings of Present Data Systems

To understand why present data systems have so little relevance to planning, one has to examine the perceived institutional needs that have led to the establishment of the existing systems. To begin, a few observations are in order:

1 With a few notable exceptions (e.g. Program Planning and Budgeting System, Multi-Year Forecasts, etc.), systems typically arose because of a particular need in a discrete organizational unit, usually a unit smaller than a ministry. In many instances the need was associated with an administrative crisis, resulting in a narrow focus approach to the design of a data system to satisfy a single, specific need. Because of the pre-eminence of the crisis, less salient needs tended to be ignored in the development of the data system, leading to a multiplicity of single function systems.

2 The government is organized around ministries, branches, and agencies whose boundaries constitute barriers to intergroup communication. Particularly during

those periods of stress and crisis when most data systems have been established, communication has been especially poor. Consequently, it has been difficult for parts of the government not immediately concerned with the implementation of a data system to make their own data needs known to the system designers.

3 A proprietal view of a data system is often taken by government units because of their fiscal responsibility for the system. This internalized view is usually manifested by secrecy about the system; not secrecy in the sense of refusing data to other units, but in the sense of not notifying other potential users of the existence of the system itself. In part, this reaction can be construed as a need to protect the originating unit against the demands of other groups with possibly conflicting goals and priorities for the data.

4 Administrative needs have usually taken precedence over research, evaluation, treatment and planning needs. As a result, the number of systems established for purely administrative purposes vastly outnumbers those established for other types of needs. Most frequently research, evaluation and planning are forced to rely for data on administrative records which are more or less inadequate for their requirements. At present, the exploitation of such records is technically difficult because of differences of concepts (e.g., Who is a beneficiary?) and storage in non-compatible media. In addition, the data are not identified or categorized in uniform ways, for example, by social insurance number, location or age groups. Thus, consolidation of data from administrative records is currently very difficult.

5 Sometimes the parochial need that gave rise to a data system in a unit was not sufficient to justify the computerization of the system. However, had the needs of other government units been considered, computerization might have been indicated. For example, Ontario's vital statistics are maintained by a non-computerized system which, while highly efficient in terms of producing the records required by the Vital Statistics Act, limits their usefulness for research by other ministries.

6 The only needs that government data systems were designed to satisfy are government needs. No particular provision has been made for potential users in the private sector such as universities, social planning councils, etc.

## Conclusion

It has been apparent for some time that some new form of decision data system is required to facilitate the exchange of data planning purposes both between ministries of government and between governments themselves. In response to this need, Ontario is developing INFO (Information Network for Ontario) which I shall highlight using the overhead projector. (Editor's note: Contact D. Herman directly for details related to INFO.)

# Role of Operations as Seen by Operations Function

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## Abstract

The Ministry of Transportation and Communications of Ontario is engaged in the development of a variety of data processing systems to support its wide ranging operations. Based on past experience, the success of the applied information technology depends largely on two factors: cost and complexity. The users' ability to absorb the impact of a complex system on both the organization and the operation is cited as equal in importance to the ability to afford the applied information system.

## Résumé

Le ministère des Transports et des Communications de l'Ontario est en train de mettre au point une gamme de systèmes de traitement des données qui lui apportera une aide importante dans son vaste éventail d'activités. D'après l'expérience acquise, on a conclu que le succès des systèmes informatiques dépend surtout de deux facteurs: le coût et la complexité. On considère que la capacité qu'a l'usager d'absorber l'impact d'une système complexe (tant sur l'organisation que sur l'exploitation) est aussi importante que sa capacité de s'offrir le système informatique.

## Introduction

In order to discuss information technology in the proper context of operations, a brief description of the Ministry's functions and organizational structure is provided.

## Organizational Structure and Functional Activities of the Ministry of Transportation and Communications (MTC)

Administratively, the Ministry maintains a Head Office in Downsview, but the province is divided into five regions and 18 districts, each with its own office and well-defined functions. In total, the Ministry employs just over 11,000 people.

MTC has a wide range of activities, other than looking after more than 13,000 miles of provincial highways. Through its subsidy program, the Ministry is involved with municipal transit and road systems. Through the Toronto and Area Transportation Authority, it is responsible for GO-Transit and through the Ontario Northland Transportation Commission for norOntair, the province's commuter air service in the North.

Essentially, it is concerned with the development and maintenance of a broad and integrated system of transportation and communications throughout the province.

While MTC's Head Office is charged with such functions as program management in the broad sense, the regions and districts look after highway maintenance, the design and construction of capital projects and day-to-day operation of the highway system.

The Ministry is presently in the process of decentralizing a number of head office responsibilities. This program, which is being tested in one region, is expected to be operational in all five regions in about one year's time.

When it is completed, the decision-making process will remain in head office but the implementation of programs will be the responsibility of the regions and districts.

This new management structure makes it imperative that a good communications system, providing timely, relevant information about field operations be established in the Ministry. As research, policy setting, standards and senior management will still reside at head office, there will now be three major management groups (district, region, head office) requiring up-to-date information tailored to their unique needs.

**Information Technology in the Operations of MTC - An Overview**

There are four areas of activities in the Ministry where information technology plays a vital role:

1 Transportation Regulation (Driver and motor vehicle licensing)

2 Engineering Services (Mapping, Photogrammetry, Remote-sensing)

3 Administration of finances and personnel (budgeting, subsidies, personnel records, etc.)

4 Operations and project control, including engineering and research activities.

Each of these areas requires the application of information technology, but at vastly different levels of sophistication.

For example, for the Driver and Motor Vehicle Control, the requirements are relatively simple: Ontario has over four million drivers and about as many registered motor vehicles. Thus the specification for the ADP system can be summed up as: Store a large number of logical entries with relatively small segments into a system which can provide instant access for data display and update.

The current on-line system is supported by the IMS/IBM software package. It took some time to make the system operational, but now it is working very satisfactorily, although at considerable cost.

The Engineering Services have wide-ranging activities, such as mapping, photogrammetry and computer-graphics, and, by nature, this field is using a very specialized and highly automated version of information techniques.

Yet, even in this area, there is a conscious drive to carry out simple projects at the production level. These consist mainly of Line (Strip) Mapping and Engineering Mapping activities using digitized photogrammetry techniques.

Although the technology is available now to implement more advanced, automated procedures, such as computer graphics for editing or the more direct use of the digitized maps (files) in the engineering design functions, at the present time the cost of application of these techniques and the complexity of such system at the user level are both considered excessive.

The present information technique used for the administration of finances and personnel data is under review, and it is due for replacement in about a year. The previously mentioned regionalization of functions is playing a major part in this system development. The approach to the new system proposal reflects the government's new system development technique as it was prescribed in the COGP recommendations.

The coordinator, in close cooperation with the appointed representatives of the users, worked out a proposal which is now under consideration.

The proposal calls for the installation of "intelligent terminals" in each of the regional and district offices of MTC, with ties to the main computer at Downsview. Although initially the system will provide software to support only administrative and projects control functions, the facilities, at a latter stage, can be utilized for engineering, planning and other functions by the addition of some carefully designed software.

### Application of Information Technology in Engineering and Planning

Around 1970, in the field of engineering, a series of ambitious projects was initiated specifically to support the planning and design functions.

In support of the planning function, a large data bank system was created. The reference system for this data bank was to have a coordinate-based (3°MTM) geometric base file.

To support the geometric road design function, a complex, automated system was planned, called the Total Information Model (TIM).

After more than two years of development work, these proposals were reevaluated and eventually rejected. The management and the designers at this point all realized the magnitude of the task in terms of cost and complexity.

While the cost turned out to be prohibitive, the realization that the proposed systems were too complex to be readily understood, and used, weighed heavily against the adoption of the systems.

### Assessments and Observations on Past Efforts

It seems as if the systems designers all too often reverse the priorities: when the systems are designed, they build the user's requirements around a chosen or favoured piece of hardware or software package, instead of designing the software and the hardware configuration to suit the user's requirements with the objective in mind, to cause minimum changes and disruptions in the users' operational procedures. Users' needs are seldom properly researched and analyzed in the operations field.

System proposals are incomplete because they do not deal adequately with the problem of impact on the organization and on the operating individual.

The post mortem on the cancelled Data Bank project produced a series of recommendations, which are being observed in Planning Division's latest effort to develop an information system in support of its planning function.

Some of the major lessons are these:

1 Develop simple, easily understandable and operable systems to facilitate information flow and data processing in support of the planning function.

2 Prepare detailed specifications for every subsystem as well as for the initial total system requirement.

3 Exercise the highest possible control over all phases of the project development, such as cost, scheduling, module testing and system acceptance.

4 Justify every part of the system by cost-effectiveness analysis and blow the whistle when the actual cost exceeds the estimated cost.

5 Determine the level of automation which will allow the user to maintain control over the various levels of operations and set the level of complexity which is acceptable to the operating staff. In effect, automation by gradual evolution and not by sudden revolution.

6 Insist on the kind of documentation which is what YOU, THE USER CAN UNDERSTAND AND USE - often it is the only useful documentation in the long run.

7 Finally: never replace a functioning system until the new one has proven itself, even if it means running parallel operations for some time. Development and "phasing-in" must not interfere with current routine operations.

**Conclusion**

In summary, although some of the Ministry's activities require a very sophisticated - and consequently very costly - application of information technology (as it was shown in the example for the Drivers and Motor Vehicle Control), the current approach within the various departments of the Ministry is to initiate and support information systems development, which promises simplicity with a correspondingly acceptable cost.

This, on the one hand, demands a much more active involvement by the user in the detailed specification of requirements and in the project's control. On the other hand, it requires, from those experts who are designing the system, more accuracy in cost estimates and avoidance of the promotion of complex systems which can neither be properly used, nor afforded.

## Role of Operations as Seen by Management Function

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### Abstract

The land data banking system being developed in the Maritimes is based on integration of files. The shortcoming of the popular philosophy of massive data banks and the strength of the LRIS solutions to these shortcomings are outlined. The building block of the Maritime data bank - the land parcel - is described in context of the LRIS program.

### Résumé

La raison d'être de la banque de données foncières que l'on établit présentement dans les Maritimes est l'<u>intégration</u> des dossiers. On étudie dans ce document les lacunes des gigantesques banques de données (que favorise un mythe populaire), de même que l'opportunité des solutions proposées par le Service du cadastre et de l'information foncière pour combler ces lacunes. Les données sur les parcelles de terrain qui constituent le stock de la banque sont étudiées dans le cadre du programme du Service.

## Introduction

The background and functions of the Land Registration and Information Service in the Maritimes are explained in the paper by R.L. Simpson, "Land and Property Registration Systems" which he is delivering at one of the Plenary sessions at this Symposium. In order to put this whole subject of "information technology" in perspective from the LRIS point of view, however, it is useful to briefly review the program.

## Overview of LRIS

In essence, the Maritime Governments agreed to act jointly through the Council of Maritime Premiers:

(a) To proceed with an integrated program of surveying and mapping as the information base is necessary for all land-related development;

(b) To replace their manually recorded registry systems, based on a "Metes and Bounds" concept of title description, with an on-line computerized system of Guaranteed Title; and

(c) To examine the feasibility of a Computer-Based Land Data Bank System to be developed as a natural progression to exploit the full potential of all phases of the program.

To accomplish these objectives, LRIS was established to carry out the program in four phases:

Phase 1 To establish a secondary control system of coordinates in a close grid throughout the Maritime Region based on the National Geodetic Grid.

Phase 2 To produce planimetric, topographic and property maps at predetermined scales to meet growing demands associated with resource management, urban development and property identification.

Phase 3 To replace the present land registry system with a new system to take advantage of modern technology and of the survey and mapping phases.

Phase 4 To establish a computerized storage system (Land Data Bank) for the inter-related land statistics, using the land parcel information acquired in other phases of the program as the basic building block.

At this point in time (3 years after the formation of LRIS) phases 1 and 2 are well underway, and an on-line computer system is currently being developed to handle the registry office function (Phase 3).

**Information Technology in LRIS**

Although a land data bank system (Phase 4) is often seen as an off-shoot in various survey programs in other parts of the world, the Maritime land data system is considered as an integral part of the LRIS program. The methodology of the first three phases is designed to allow efficient implementation of this phase.

There is no question as to the need for more detailed and better organized data - the problem is how to make a system operational which ensures that data are both current and accessible. Cost benefit studies completed before the program was undertaken have shown that such a system, if operational, would be viable - more than that, invaluable to many user groups participating in area development planning.

It is obvious that Urban Information Technology is a major concern of LRIS in Phase 4, and our approach to these and other information technologies has one basic tenet:

> It is essential that responsibility for files remain with the major user collector and that information transfer between files be by integration of these files, rather than by aggregation into a massive data bank.

This philosophy has evolved over the last 2 years to meet expanded demands for government services, while avoiding the mistakes of other attempts which developed around monolithic computer systems and masses of varied files.

**Selected Past Problems**

Governments have usually reacted to data management problems in the past by creating massive data banks, which have been costly and largely ineffective. Symptoms of an ineffective operation include:

Data are invalid, poorly edited and out-of-date.

Hardware is overloaded due to the geometric increase in file complexity when

all data are combined.

Speed of response is unsatisfactory.

Use of the data bank service is far below the level of original expectation.

### Corrective Measures

All too often the corrective measures to remedy the situation are also ineffective. They include:

Use more analysts. This merely enlarges a team already too large for good communication and produces even more serious disasters.

Take longer in design and analysis. This is unacceptable because the rate of change in social requirements and technology is already making systems obsolescent by the time they are put into operation. On the contrary, systems must be developed and redeveloped more quickly if they are to stay in step with the rate of change in the world surrounding the system.

Force the user to adapt to the system. This is absurd (except for a trivial amount of training) because it reverses the roles of user and system to make the user the servant of the system.

### Putting Lessons Learned Into Practice

There is now a conviction that the concept of a single monolithic system is prone to failure, due mainly to the impossibility of coordinating analysis and development where scores of systems analysts and thousands of users are expected to communicate without well-disciplined methods for communication.

Our strategy lies along the line of operating a federation of subsystems where each subsystem has certain characteristics (See Figure 1):

Each subsystem is usually owned by a line operation which needs a particular set of data in its own operation, and collects, validates, edits, and updates that data at the most local level feasible.

Each subsystem owner manages a majority of his system analysis, implementation and operation.

Each subsystem owner covers the major portion of his own cost, and justifies it by his own use of data.

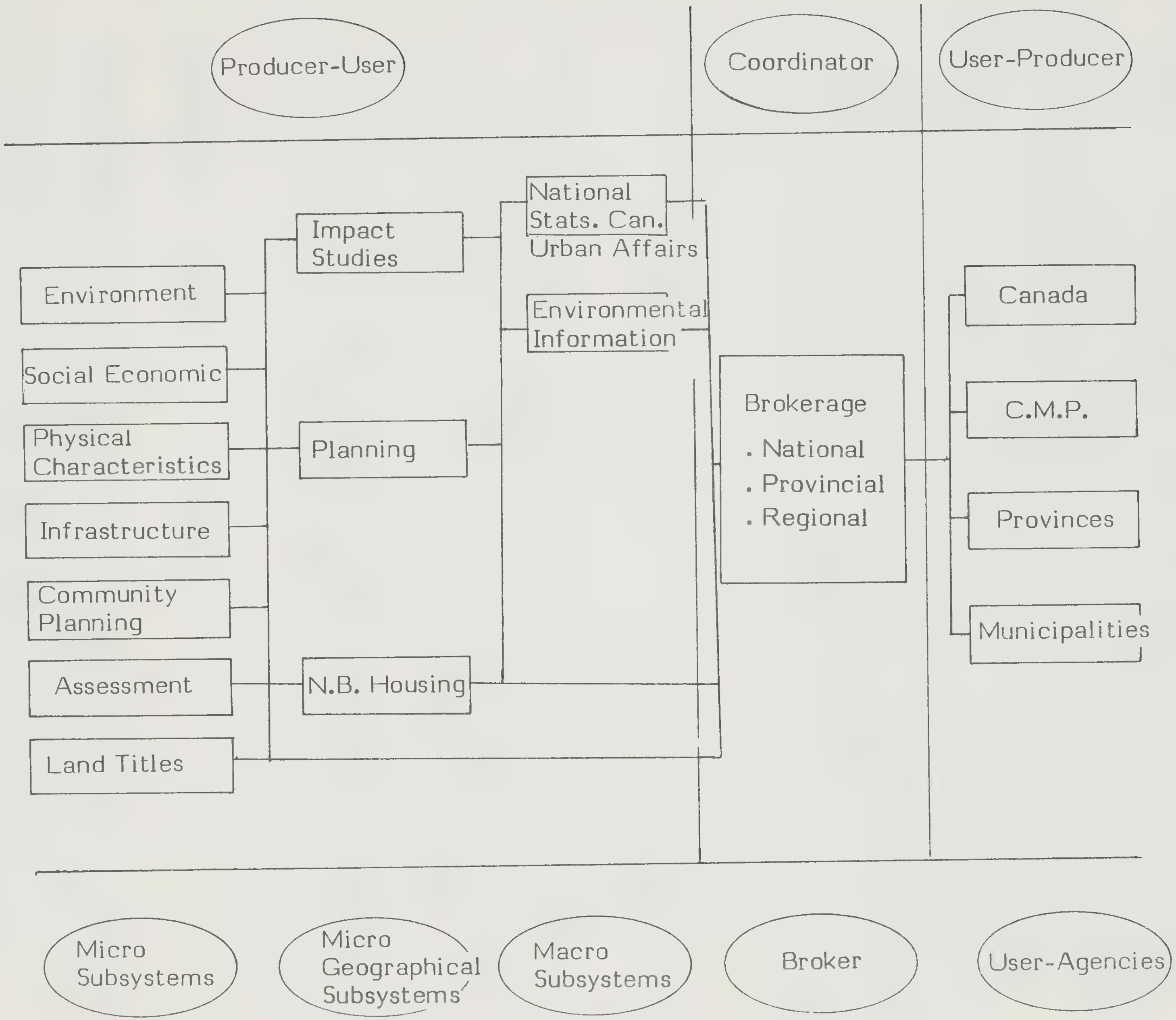


**Figure 1** Relationships of Federated Subsytems

A minority of ownership, control, and funding resides with a federation management, which requires that certain standards of the subsystem be maintained so that their data are usable by others. Direct compatibility of data files is not essential provided the data are described in a standard way, and provided that the federation has the resources to produce translator utilities.

In applying this strategy, LRIS has recognized certain benefits. Information based on coordinate identification has universal and near-permanent value, while information based on political boundaries or other potentially changing descriptors would only have limited and temporary value, In addition, there is relatively fast access to a central repository containing standardized data, and information of high quality which has wide applications.

### The Land Parcel

The integrated land data information service that has been described is composed of subsystems, each complete in itself, and each designed to store, retrieve, and access one or more data bases. These data bases are normally categorized into micro-level and macro-level data because of the inherent division between them. In order to tie together these two types, an intermediate step is needed, one that will allow geographic aggregation to conform to larger areas, but will not compromise the integrity of micro-scale data. To us, the land parcel, as a geographic unit, seems to meet all these criteria.

The whole LRIS system is based on the "land parcel" as its basic building block, in that:

(a) All land is represented by a division into parcels; all parcels are assigned unique identifiers; and all parcels and identifiers are plotted onto an integrated series of maps. It is also envisaged that parcels will be bounded by horizontal planes, thus restricting their extent in the third dimension. Parcels supported at various levels or heights will be bounded by horizontal planes, thus restricting their extent in the third dimension. Parcels supported at various levels or heights will be depicted by the use of plans prepared for specified levels (usually found in condominium developments).

(b) As parcels are mapped, identifiers are assigned to the document of information (data) collected on each parcel and the identifier is placed on the appropriate

parcel of land depicted on the map. This establishes a correlation between record and mapped parcel.

Parcels of reasonable size may be aggregated, through centroid calculation, to match resource, census, and other macro-scale data. The parcel is also small enough to mesh well with the micro-level information. Also, the land parcel is the ideal building block for the operation of several data types worthwhile by themselves, notably assessment data, land titles data, and possibly some types of network data.

Thus, the 'Land Parcel File' concept has been developed. It is a geographic file accessible by location and index number, and exists simultaneously in the macro and micro realms.

This application has definite advantages:

Maximum flexibility can be achieved in the selection of data bases and information systems - both can be included randomly without affecting the overall operation.

Various data bases can be centralized at one point, thereby enabling the user community to contact only one agency. However, the actual physical storage of certain data bases could still be widespread.

A number of information systems handling complex data bases can be implemented at a minimum of cost and time, thus relieving LRIS staff of development tasks.

Various data bases can maintain their original form and hence maintain their original value for those who design and use them.

## Conclusion

The philosophy of Phase 4 of the LRIS program has been presented. This philosophy is what we feel must be the first part of the management overview when considering the implications of providing a viable, operational, information system. Figure 1 illustrated the basic tenet - that systems are integrated but separate. We see the role of LRIS as the developer of the system, and then either LRIS or an off-shoot of LRIS would assume the role of the coordinator. It is important that this function exist <u>between</u> the user and the system, so that the system responds to the needs of the users while still remaining practical.

## Rôle des services: point de vue des services de traitement des données

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### Résumé

Le rôle de l'exploitation est d'être active tant dans le secteur de la planification du traitement des données que dans celui de la mise au point des systèmes. Cette participation est possible au moyen d'une bonne organisation comportant la mise sur pied d'un "comité consultatif", la décentralisation des services de développement et l'accès à l'information. Le comité doit établir de meilleures communications entre les usagers et le service de traitement des données, et coordonner le développement de ce service.

### Abstract

The role of operations is to be active both in the planning of data processing and the development of their systems. That participation can be realized through proper organization such as an "advisory committee", decentralization of development, and access to information. The committee must establish better communications between users and D.P., and coordinate the development of D.P.

## Introduction

La Communauté urbaine de Québec est un organisme administratif régional dont le but est de rendre certains services accessibles à tous les citoyens de la région.

Elle représente aussi, jusqu'à preuve du contraire, le moyen par excellence de régler des problèmes régionaux qui autrement demeureraient insolubles à cause de l'existence d'une multitude irrationnelle de divisions territoriales et de structures politiques et administratives.

La C.U.Q. a juridiction sur l'évaluation, le traitement des données, le tourisme et les congrès, la promotion industrielle et l'aménagement.

## Le traitement des données à la C.U.Q.

### Janvier 1970 à août 1973

Au début, la centralisation de tous les services informatiques de la C.U.Q. constituait le principe directeur. On voulait ainsi favoriser la rentabilité de l'entreprise.

Cependant, nous avons pu constater à l'usage que cette approche présentait un grave inconvénient: le manque de souplesse dans la réponse aux besoins des usagers. En effet, à cause de la disponibilité limitée des ressources en développement offertes par notre service, il fallait sélectionner parcimonieusement les applications à développer, et cela au détriment des priorités particulières de chaque utilisateur (qui devait donc compenser par des palliatifs plus onéreux).

### Août 1973 à aujourd'hui

Une orientation nouvelle fut prise au mois d'août 1973, en accord avec les principaux utilisateurs qui furent regroupés dans un comité appelé le Comité consultatif de l'informatique de la C.U.Q.

Le Comité consultatif de l'informatique est formé d'un représentant par secteur de la C.U.Q. (soit 5 représentants venant des villes de Québec, Ste-Foy, Val Bélair, Charlesbourg et Beauport), et d'un représentant des organismes suivants: C.A.C.U.Q. (Commission d'aménagement de la Communauté urbaine de Québec), C.T.C.U.Q. (Commission de transport de la Communauté urbaine de Québec) et S.E.C.U.Q. (Service d'évaluation de la Communauté urbaine de Québec). Le S.I.C.U.Q. (Service d'informatique

de la Communauté urbaine de Québec) y délègue deux représentants.

Le comité a pour fonction d'améliorer les communications entre la C.U.Q et les usagers et entre les usagers eux-mêmes; cela permet de mieux planifier et coordonner les activités du S.I.C.U.Q.

Lors de la première réunion du Comité consultatif de l'informatique, le 20 août 1973, les usagers se sont entendus sur l'orientation suivante:

1 Autoriser l'autonomie de développement et de production des applications à caractère local aux utilisateurs qui le désirent, en leur permettant:
   a) d'avoir leur propre personnel d'informatique. Ce personnel pourra cependant être supervisé ou conseillé par le S.I.C.U.Q..
   b) d'avoir un terminal se raccordant à l'unité centrale du S.I.C.U.Q. pour faciliter le développement et la production de leurs propres applications.

2 Laisser le S.I.C.U.Q. concentrer ses efforts sur des applications d'envergure régionale, c'est-à-dire dont tous pourront tirer profit.

3 Continuer à supporter, dans la mesure du possible, les petits utilisateurs qui ne peuvent se doter, de façon rentable, des ressources nécessaires à leur mécanisation.

La nouvelle orientation de l'informatique à la C.U.Q. a permis une augmentation considérable dans le développement et l'amélioration des systèmes, sans pourtant augmenter le personnel du S.I.C.U.Q. qui est stable depuis deux ans.

En effet, les villes de Québec et Ste-Foy et le Service d'évaluation de la C.U.Q. utilisent présentement de 30 à 40% du temps ordinateur alors qu'en février 1975, leur utilisation était nulle. Il est bien entendu ici que cette utilisation se fait en vue de satisfaire les besoins locaux de ces utilisateurs.

Nous prévoyons qu'en 1981, les différents services utiliseront plus de 75% de l'équipement disponible pour satisfaire leurs besoins locaux. Nos prévisions des besoins de 1981 laissent aussi entrevoir une utilisation cinq fois plus grande qu'aujourd'hui.

## Conclusion

Les services utilisateurs ont considérablement modifié leur rôle en ce qui concerne l'évolution de l'informatique à la C.U.Q. De spectateurs qu'ils étaient en 1971, ils sont devenus des joueurs actifs.

Le Comité consultatif de l'informatique leur permet de participer à la planification des activités et à leur orientation, tandis que la décentralisation du développement leur permet de mieux satisfaire leurs besoins.

Ce résultat, qui sera sûrement appelé à évoluer dans l'avenir, répond aux aspirations les plus profondes des utilisateurs; en effet, ceux-ci n'étaient pas satisfaits de la situation qui prévalait avant 1973, et c'est en les consultant que l'orientation actuelle a été décidée.

Cependant, bien que cette façon de faire comporte des avantages certains, tels un développement plus rapide et une meilleure réponse aux besoins particuliers des utilisateurs, il demeure certains inconvénients.

En particulier, cette méthode a pour effet d'accroître l'utilisation de l'unité centrale de traitement plus que dans un environnement centralisé. Par suite de cela, les budgets augmentent dans des proportions difficiles à défendre. De plus, le manque de contrôle sur le développement des applications locales risque de laisser passer des projets normalement non rentables, étant donné qu'il n'y a pas de charge directe à l'utilisateur.

Une étude sur ces questions est en cours de réalisation et elle sera déposée en mars 1976. Ses conclusions nous permettront d'éliminer ces inconvénients et par la même occasion, d'accroître la rentabilité de nos services.

En résumé, le service d'informatique de la C.U.Q. et ses utilisateurs sont constamment à la recherche de meilleures formules qui leur permettront de se donner les meilleurs services aux meilleurs coûts.

# Role of Operations as Seen by Data Processing Function

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## Abstract

Operations functions in urban (or other) governance are the prime users of information technologies in their routine work, and as such are the sponsors of any evolution in that field. In addition to their sponsor role of individual developments designed to fulfil specific requirements, their additional objective should be to contribute through each specific system towards an integrated information technology at the particular level of government. At present the concern should be with management and administration of data.

## Résumé

Les services de l'exploitation des administrations municipales (ou autres) sont les premiers usagers de l'informatique dans leur travail courant et, par le fait même, ils sont les parrains de toute évolution dans ce domaine. En plus d'apporter des améliorations particulières répondant à des besoins précis, ils devraient aussi avoir comme objectif de contribuer, au moyen de chaque système en particulier, à la réalisation d'une technologie informatique intégrée à leur palier respectif de gouvernement. A l'heure actuelle, ils devraient mettre l'accent sur la gestion et l'administration des données.

## Introduction

As the interest in this Symposium indicates, the situation in regard to information technology at the local level is subject to continuing concern, and it cannot be said that its evolution happens in an orderly fashion. Rather it seems that the degree of chaos is proportional to the size of the urban area, which is not so much a reflection on the ability of any particular city to harness emerging information technology as on the general state of the art in that field. For about a decade we have used computers and the present ones are quite powerful, yet learned scholars tell us that the information - communication revolution has hardly begun. However, rather than despair we should look realistically at the potential of information technology at any time, and try to use it to our advantage.

Operations functions (whatever their actual organizational representation may be) are the prime users of any information technology as a tool in support of their routine work, be it registering building permits or putting in sewers. The point this paper tries to make is that there are two kinds of objectives in the development of a particular information system which should be supported by any particular operations function in order that the evolution is orderly and not chaotic.

## Information Technology

For the sake of argument let us consider information technology as comprising the facilities for storing, accessing and manipulating data for the purpose of deriving information and therefore let us include only those systems which provide man-machine interfaces (and exclude process-control systems for example). This technology consists of data storage, communication, and data manipulation facilities. To date efforts in developing information systems have emphasized manipulative aspects, as they seemed to be limited in scope due to hardware limitations. However, during this course the aspect of availability of data has been neglected. Data are assumed to be there and their link to the manipulation algorithms to be a simple matter. But it is interfacing the data with their manipulation programs that now limit the scope of information systems. Information processing is in more correct terms data processing if we consider data to be collected, stored, processed and displayed in order that the human perceives information in a higher sense. Information is

based on data, and its quality is dependent on the quality of the data. Of course, it is not only quality of data about which operations functions should be concerned.

### Operations Functions

Operations functions relate to the following range of activities: to regulate, to provide service and to maintain legal records. In doing so they are users of information technology. Data processing is supposed to make work more efficient, that is, to promote more work, faster, at same or less cost. These (operations) users make specific demands on data processing either regularly or on an ad hoc basis, with specific objectives, which data processing has to fulfil to the extent possible.

Many operations functions make up a particular urban governance activity, and, consequently, they are interdependent. While each operation function places a particular function-specific objective on information technology, there is also a global objective on the level of the particular governance. So far, in most cases, this has been expressed in very general terms (usually, for example, "to have better information"), but needs can be expressed in clearer and down to earth terms if necessary. (For example consider our daily experience of roads being opened and closed first for the sewer construction people, then for the hydro people followed by the telephone people; the global objective could be to coordinate these activities, which in turn would require the integration of information handling with the involved parties.)

As information is based on data, this then requires interrelatability of data. It is in this area that, presently, the various operations functions should contribute towards the evolution of more integrated information technology. This can be done by considering the needs of other departments, by contributing towards standardization of data, by documenting the data, in short be treating data as a valuable asset. Data administration groups have been established in many organizations, precisely as a consequence of this realization.

## Conclusion

The need for compatibility of data and information has long been recognized in the area of geocoding (and, for example, promoted by Statistics Canada through its development of the GRDSR system, which enables the linking of data and statistics to a common spatial framework), but the concern about it should now be extended. Operations functions should consider the need as part of the objectives for any information technology development which they sponsor.

# Role of the Operations as Seen by Planning Function

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## Abstract

Under our present multi-tiered governmental system with overlapping planning and operation functions, lack of integration of activities is often more the rule than the exception. A first step toward a more comprehensive, integrative effort is the creation of a joint interdepartmental information system to house similar data sets and thus minimize duplication in data collection and manipulation. The information technology to realize this effort is known and readily available. The problem, however, is the development of a framework within which each department can actively contribute, i.e. a formalized interdepartmental information exchange network.

## Résumé

Dans le présent régime gouvernemental à plusieurs paliers, où les fonctions de planification et d'exploitation se chevauchent, le manque d'intégration des activités est plus souvent la règle que l'exception. Une première étape vers une intégration plus globale serait la création d'un système d'information mixte interministériel qui contiendrait les ensembles de données de même nature, diminuant de ce fait le double emploi dans la collecte et la manipulation des données. La technologie nécessaire est connue et disponible. Mais le problème consiste à mettre au point un cadre au sein duquel chaque ministère pourra apporter une contribution active, c'est-à-dire un réseau officiel d'échange d'information entre les divers ministères.

## Introduction

With the recent acceptance of multi-tiered levels of government, complete with their overlapping planning and operating functions, planning has become fragmented. This situation can and does harbour inefficiences. It is a structure within which the staffs of the departments of a local government are not only charged with the responsibility of developing programs to achieve their own sectoral goals and objectives, but these same staffs must also interpret programs devised by other local departments for implementation within a shared sphere, be it spatial and/or functional.

Nowhere is this split responsibilities situation more evident than at the local level between the planning and operating functions. These departments must often enter into extensive programs in order to determine the implications of planning function decisions on their own activities. It is an exercise that can consume considerable time and resources unless a framework exists to handle such a requirement.

By way of illustration of the above points, let us consider a particular problem. If, for example, an initial land use decision is shown to be impractical from a functional (operational department) standpoint, the outcome of this decision exercise raises questions concerning the integration of the planning process. This is especially true when the planning department and perhaps other departments have already made such schemes public. Experience has shown a need for a framework within which the consequences of planning decisions can be quickly determined and assessed.

## Towards Improved Planning/Operations Relationships, In Principle

Replacing this partitioned decision making with a totally comprehensive planning effort is probably both unrealistic and undesirable. However, an effort must be made to promote interaction and cooperation between the planning and operating functions, especially when structured within a multi-tiered governing system (e.g., Regional/Metropolitan form of urban government). Only through such cooperation will the operating functions be able to test quickly the consequences of land use decisions and hence give the appearance, in part, of a comprehensive planning effort.

Occasionally this cooperation does exist between planning and operating functions. This cooperation is frequently informal and more often than not depends upon personal

contact. In many instances, however, the situation is one of departmental isolation with each department trying to attain a state of self-reliance.

The difficulty lies in motivating various departments to integrate their activities wherever possible and desirable, while recognizing that not all elements can or should be integrated. The necessary prerequisite to achieve this integration is only that no party or side would feel it is giving up more than any other. To accommodate this, cooperation must be on a natural level and the activities already shared integrated in some manner.

**Information Technology as an Instrument of Cooperation**

Upon examining the working levels of the departments of many local governments in an effort to determine integratable activities, it becomes apparent that some of the activities performed by such departments are similar or duplicated. The collection and manipulation of data are often cases in point.

More and more, departments are amassing huge volumes of data in an attempt to determine the demand for services. In turn, these departments are employing more and more sophisticated methods of analysis to project and/or evaluate the results of proposed programs. But, in the final analysis, though the methods of analysis may vary among departments, the data collected are often identical. Obviously one starting point for moving these departments towards a more comprehensive planning effort is with the development of joint information systems to house similar data sets. Such a development would allow for quick and efficient access to the most complete information set available.

It is through such joint cooperative programs that the strengths of information technology will be recognized by local governments. The subsequent acceptance of information technology will lead to the situation where further advancements can be made. Information technology is at the stage where most meaningful advancements will come from applied situations as opposed to theoretical structuring.

The hurdles to be overcome in designing, developing, and implementing a joint information system are not so much technical as institutional in the establishing of a framework within which each department contributes.

The information to be housed in the system is already well defined. Of the two functions under discussion, the operating function is probably the most advanced

in qualifying and analyzing information. The responsibility of respective operating functions has long been precisely delimited and has justified these departments investing considerable effort in determining those variables that are felt to best describe the demand for their services. The existence of sophisticated mathematical models employed by many of the operating functions suggests that these variables have been acceptably defined and measured. The planning function, though not as sophisticated, has also managed to select a range of variables to monitor and project.

The merging, then, of these previously independent information bases into one should present no problem. Once the variables have been defined and measured and the desired methods of access and manipulation determined, the appropriate data file management system can be selected. Even the problem of geographic flexibility, if this is an access concern, no longer presents a problem to today's information technology. The existence of the American DIME system, the Canadian GRDSR system and numerous lesser systems, attest to this.

## Conclusion

The problem, and solution, then, becomes one of developing a formalized interdepartmental information exchange network. Alone, this is a worthwhile goal which allows for the deletion of redundant systems and eliminates the development of such systems in the future. In addition, other gains to be attained from such a network include: improved interdepartmental communication, increased interaction, and a resulting change in the perceived role of each participating department.

The path to be followed should now be clearly in evidence. The decision on the part of local government departments to design, develop and implement an integrated information system holds promise for not only the continuing development of information technology once in the most productive and visual situation, but such a systems acceptance will promote that often sought after comprehensive planning effort.

## Discussion of Track Session B - Role of Operations Function

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In presenting a review of Track Session B, let me first say that it will be a very personal, probably biased, and certainly a layman's review of what has happened. For what the speakers really said, I refer you to their papers; here, however, are the highlights, and the thoughts they left with me.

Doug Herman, of the Ontario Ministry of Culture and Recreation, spoke of their efforts to develop methods of interchanging information between branches of the Ontario government and also with other governments. Individual information systems, usually spawned by an administrative crisis have lead to a multiplicity of non-integrated, narrow systems. They have usually been operating systems rather than decision data systems. The staff function (as against line, or operational function) demands decision data, and usually needs it from a broad spectrum of operational data - hence the problem. As well as the crisis-birth nature of the systems there are other difficulties associated with the proprietal view taken by the systems originators, the operational as against research orientation of the data, the parochial nature of the need leading sometimes to a partially-mechanized system, and the very fact that by intent only governments' special needs of quasi-governmental agencies tend to be badly met.

To overcome these problems Ontario is developing the Information Network for Ontario (INFO). It is related to National Health & Welfare's ANSSIR (A National Social Security Information Resource), and is presently in partial operation with a number of files on it including a certain amount of textual material. Since other provincial governments are taking a similar approach, there is the possibility it may lead to an integrated national system.

Albert Bene of the Ontario Ministry of Transportation and Communications described his department's major information systems as being in transportation regulation, engineering services, administration of operations, and planning, research and design. Some operational systems have been costly but of immense practical value; for example one system contains some four million drivers licences, plus motor vehicle licences and accident records. On the other hand, there have been a number of overambitious projects in which complexity and cost ran away, and work on them had to be stopped. The new systems which will support planning will accent simplicity, economy and high quality data, with a low accent on automation

- to quote the author - "mechanising a badly working manual system is asking for trouble".

There is a trend to regionalisation but whilst communication to the head office is good, feedback to the region and the district is non-existent. Moves are being made to introduce terminals in the field but it is feared that even if the equipment is there, the understanding may not be.

Robert Simmonds, of the Maritime Provinces' Land Registration Information Service, amplified one of the plenary session addresses (Simpson). He accented the importance of thorough preparatory work at the overall program level, before any computerisation is attempted. Another important aspect of the regional program is that wherever possible the subsystems will be owned and maintained by the user branch or city, with only the absolute basics (e.g. the land parcel file) being a central responsibility. This concept leads to the idea of a network of interconnected computers. A discussion followed on the ease with which such a system can be created, the necessity to involve the network people in the early planning, and so on. It is claimed that having looked at many systems, they have taken the best from each and stand a good chance of avoiding the pitfalls which wrecked earlier, similar systems.

Jacques Huot, of the Quebec Urban Community, addressed the problems of developing a coordinated regional information system to serve a community of some 27 existing local authorities. Various levels of management sophistication and various existing capabilities have caused the regional project to go through several organizational approaches before settling for a central machine with basic central files (e.g. assessment), but with other services being delegated locally.

Martin Podehl, of Statistics Canada, initiated a discussion of the philosophy of integrated information systems. He remarked that in fact information is the human perception, the understanding obtained from data - and that we really are talking about data processing. The difficulty is in trying to identify information needs. Frequently EDP technologists think they see a global objective and try to promote it - even though the users don't see it that way. There followed a spirited discussion with viewpoints presented ranging from only moving after needs are well defined, to expressions of adequate system capability which allows collecting data in advance to meet needs that even the potential user cannot yet identify. Martin cautioned that Statistics Canada had twice burned itself on big, over-ambitious projects. And finally - to quote him - "there are few things as bad as having fast access to the wrong data".

Gordon Dittmer and Ron Desroches, of the Planning Department of Ottawa-Carleton Regional Government, addressed the problem of meeting planning needs for information when cooperation and data access is needed both horizontally (between departments) and vertically (between different levels of government). The problems are institutional - not technical, and generally require formalizing at an adequately senior level the de-facto working level relations which arise just to get the job done. Other considerations temper any system development. To illustrate this point they referred to the relatively specific, accurate hard data and models that operating departments have (for example needed sewer sizes to serve a given population) compared to the relatively soft and option-dominated models and data of the Planning Department. Sophisticated models exist for use in the actual planning process but few agencies have the background, the data or the resources to put them into use at this time.

By way of conclusion let me make a few remarks on the track session as a whole - or perhaps they are on the conference itself. The remark was made at one of our sessions wherein we addressed "The Role of the Operations Function As Seen by Operators", that in fact nobody present was from operations - that in fact we were information technologists talking to information technologists. Later however we did find we had planners, social scientists and geographers, survey engineers, transportation specialists and so on - so although we were unable to stay in line according to the session title, we in fact had a broad range of viewpoints present and expressed, perhaps even broader than the Symposium organizers had dared hope for. But as against the widely based audience let me make a personal remark on the papers, a thought that reflects remarks others have made.

I am concerned that Information is more than Data, and that Information Technology is vastly more than EDP - and yet we have heard very little else at the Symposium. I came hoping to hear not only what EDP was doing to help efficient governance, but also to hear what technology is doing - or should be doing - to create information flows - two-way information flows - between the governors and the governed. I have heard little; I even sense that in some ways such things are not even wanted; and yet at a personal level, as a citizen, as a concerned individual I feel that this lack of good, two-way vertical communications within the total process of governance, and between all involved in government, is perhaps a major cause, or at least a strong contributing element, to the alienation which plagues society today. Perhaps a future symposium will allow us to review together what we can do to overcome this growing problem within our hopefully democratic society.

## Role of Planning as Seen by Planning Function

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### Abstract

The purpose of the paper is to show that information technology has an important role to play in the planning function of government. The Winnipeg Housing Analysis Package (WHAP) is offered as an example of an information system designed to provide housing information to planners. The project developed from a need to rationalize existing data about single family and semi-detached dwellings and is now looking at future information needs for comprehensive planning and policy making by various levels of government. The four function areas of information technology are operations, planning, system development and management. Each function area is then related to the development of WHAP as a planning tool.

### Résumé

L'objet du présent document est de démontrer que l'informatique joue un rôle important dans le processus de planification du gouvernement. Le Winnipeg Housing Analysis Package (WHAP) est présenté comme exemple d'un système informatique conçu pour fournir aux planificateurs des renseignements sur le logement. Le projet est né d'un besoin de rationalisation des données existantes sur les maisons unifamiliales et les maisons jumelées. Il s'oriente maintenant vers les besoins d'information des divers paliers de gouvernement, qui désirent une planification et un processus décisionnel globaux. Les quatre secteurs d'activité de l'informatique sont les opérations, la planification, la mise au point des systèmes et la gestion. Chacun d'entre eux est relié à l'élaboration du WHAP en tant qu'outil de planification.

## Introduction

In the past, users of information technology at the 'local level' of government have been primarily concerned with operational efficiency.[1] There has been an increasing awareness, as evidenced by this conference that the available information technology can be useful not only for operational purposes, but for planning and management purposes as well. Planners have realized that there is a need for improved information resources for planning purposes.[2] For example, McLoughlin who takes a systems approach to planning, states that: "The design of the Information System is a critical step in the planning process, perhaps the most critical of all. It must be taken with great care because the considerable investment will be very difficult to write off if serious errors in judgment occur."[3]

## The Need for Information Technology in Planning

Urban centres have experienced a phenomenal growth rate across Canada. Thus, the traditional 'seat of the pants approach' to municipal operations and planning has sometimes had to be modernized in order to cope with the sheer volume of requests for municipal services and also begin to deal with the many factors which are involved in rapid urban growth. This paper will deal only with one urban problem, Canada's housing problem.

## The Housing Crisis

The housing crisis across Canada has generated responses from several directions each of which requires a larger role for information technology in planning.[4] For example, Dennis and Fish point out that Winnipeg possessed, at least in 1973, one of the most stable and least inflationary housing markets in Canada.[5] Since that time, housing costs in Winnipeg have escalated rapidly due to a multitude of factors. Thus, the housing crisis has forced government to extend its involvement in traditionally private sector activities. It has also generated a wider public demand for more government responsiveness to specific areas of housing need. And, finally, the housing crisis is demanding a more comprehensive response from the university

planning schools. These demands in turn are encouraging to students with more varied backgrounds to enter planning schools.

### The Winnipeg Housing Analysis Package (WHAP) - A Response to a Need

The project called the Winnipeg Housing Analysis Package (WHAP) evolved from a study of the residential housing market by Bingeman et al. which uncovered a real need for government to monitor the residential building process in a much more detailed fashion.[6] Such monitoring requires an information system, and so the HUD group of the Planning Secretariat of Cabinet saw a need to develop a mechanism which would provide detailed housing information to be used by planners. The Secretariat had some experience in planner-developed information systems used for planning purposes.[7,8] However, to initiate the project in the Secretariat, it was necessary to concentrate on demonstrating the relevance of WHAP to the immediate and substantive demands of housing issues rather than on emphasizing a novel approach to information processing.[9] Initially, the Senior Staff within the Secretariat were less interested in rationalizing urban housing information needs for long range, comprehensive urban planning, but had some immediate concerns about providing housing for low income and middle income families.

WHAP is on 'ongoing - computerized inventory' of new single family and semi-detached housing units completed since 1973. Ultimately, it has the capacity to expand its data processing system into all areas of housing activity such as land development and impact on the community of new housing projects. It is hoped that WHAP will be able to provide some new information on a continuing basis to those agencies charged with the development of housing policies and the planning and implementation of programs in Manitoba.[10]

The next four sections of the paper relate the development of WHAP as a planning tool, to the four function areas designated by the symposium (namely, (i) operations, (ii) planning, (iii) systems development and (iv) management functions.

### The Information Base - Relation to the Operations Function

Once the project got underway, the first stage of development was to examine the various sources of information available for new single family and semi-detached housing. An examination of the data files of the various agencies revealed potentially useful but fragmented information. Since the project's mandate was to provide information for planners, there was no attempt made to computerize the operations of the various data collection agencies. Rather, liaison with the agencies was on an informal basis and they cooperated by giving us access to their records. It was our desire to examine the issue of planning for housing from an informational perspective and to integrate the data collected from the different agencies into a planning-oriented classification of the housing spectrum mentioned previously.

### WHAP's User Groups - The Relation to the Planning Function

Since the system would be used mainly by planners, we developed a short paper describing the capabilities of the system and we approached planning agencies at all three levels of government involved in the planning and development of housing.[11] All the planning agencies which we contacted responded favourably to the project, but expressed a number of concerns. The critical reactions of these agencies roughly fell into three main categories:

1 Some planners called the information system a 'model' of the housing market and suggested that since pieces of information had been left out of the model, it was incomplete. The planners confused the term 'model' which is an analytical technique and 'information system', which preprocesses the information for the model. Like the Secretariat Senior Management, most planners were more concerned about the immediate availability of the data for policy and program development. To facilitate communication with the agencies, it was necessary to de-emphasize the technical aspects of the retrieval procedure and to concentrate on showing the accuracy of the data and the types of analysis possible with the data (for example, more precise information on certain growth areas of the city).

2 Each planning agency wanted different items of data on housing and each wanted the information displayed in a format to suit the agency's specific needs.

To satisfy this concern, it was decided to develop a flexible system which could handle most information requests.

3 Few groups actually expressed interest in using the system themselves. Rather they expected our group to formulate the retrieval request to satisfy their particular information needs. However, other members of the Secretariat also concerned with introducing information systems technology for planners, experienced similar preliminary difficulties in working with them. However, they found that most planners soon saw the usefulness of the system when it began to deliver useful results for their work. The planners were then more willing to operate the system.

### The Design Solution - Relation to the System Development Function

The most important design criterion was to develop a flexible system which was compatible with the skill levels and the data processing requirements of planners. Since many planners are being exposed to computer languages such as APL or FORTRAN and statistical packages such as SPSS, it was felt that the use of the computer on the job would be familiar to them. In fact, the system could be used to preprocess the data for SPSS, computer mapping routines such as SYSFRA and SYMAP or other analytic/modelling routines.[12,13]

### Government Support for Information Technology - Relation to the Management Function

There is a general agreement that 'governments' or management have the responsibility for ensuring the well-being of people by making available adequate and affordable housing. All levels of government are aware of the problems associated with housing and have responded by becoming directly involved in the production of housing and by indirect involvement through subsidies. Governments also have the function of regulating the housing market. However, if they are serious about dealing with housing problems in the most efficient way, all levels of government should support the introduction of information technology into the planning and operations functions. The following are examples of the roles that each level of government can play.

The federal government has been engaged in the development of broadly-conceived national housing policies, aimed at reducing regional economic disparity and stimulating the residential building market. Although the federal government is concerned with data on a regional level, it should provide support in the form of grants to municipal and provincial data collection and planning agencies to computerize their operations. This would insure a supply of good data for federal policy and program development. The flexibility permitted by existing information technology would allow the coordination of the various local systems on a national level by coordinating development effort through an agency such as the Ministry of State for Urban Affairs.

The Manitoba Government policy publication, Guidelines for the Seventies, states that "Housing policy will be directed to ensure that Manitobans can afford satisfactory housing to meet their needs."[14] To meet these needs, the provincial government has been directly involved in the provision of housing through cost-shared and provincially funded programs. Through the Municipal and Northern Affairs departments, it also acts as the planner for municipalities outside of Winnipeg. In this capacity and in other areas, the provincial government needs accurate information with which to carry out these tasks. WHAP is seen as one way of processing that information. However, to be really effective, WHAP needs the support and cooperation of other levels of government.

In its capacity as the planning coordinator for the City of Winnipeg, the municipal level of government generates some of the most comprehensive and most useful information on urban housing. It must be prepared to share some of this information with the senior levels of governments so that planning at all three levels of government can be coordinated effectively. In return, the municipal government should expect assistance from the provincial and the federal levels of government to facilitate the introduction of information technology to its municipal operations and planning functions.

## Conclusion

Governments have the option of responding to the housing crisis with the traditional 'seat of the pants' approach which relies on insufficient information and ad hoc decision making. Such an option may appear to cope with situations well enough,

but in the long run, many urban problems outrun the capacity of any government to rationalize them and to deal with them in this way. As Barry Wellar points out, an important class of urban problems may simply be beyond human mental capacity to handle in a way that a computer-assisted or computer-driven system could.[15] Because housing is a necessity, governments will be making policy and developing programs in this area regardless of the available information technology. It would be naive for information system designers to think otherwise, and it is incumbent upon this group to respond with systems which are designed to be within the technical capabilities of the planners and decision makers. Obviously, the creation of information technology in the housing area requires coordination among government decision makers, planners, information designers and program delivery agencies, and it requires that all four groups be responsive to the public which needs and uses shelter.

As pointed out earlier, government decision makers and planners may demand immediate computerized results rather than the development of a flexible, comprehensive information system. This may be equivalent to demanding that an information system play the traditional role of information technology in planning and decision making - in other words, the 'seat of the pants' approach with computers.

If planners feel that the technology is beyond them, they may choose to rely on insufficient data from spot surveys or on intuition. Clearly, the use of information technology in housing is only possible when planners decide to seek the assistance of system designers. System designers without the expertise of planners will find it difficult to locate relevant areas of concern and to present government with the appropriate information system. The use of information technology in the planning function has been undertaken successfully in Toronto and Calgary.[16,17] It is hoped that the development of WHAP will be consistent with this approach of providing information of satisfactory reliability for comprehensive planning.

1 The expression 'local level' is ambiguous. What is really meant is 'responsible level' since every level of government is concerned with this problem.

2 Doris Holleb, Social and Economic Information for Urban Planning, Vol. 1 (Chicago, 1973), p. 6.

3 J. McLoughlin, Urban and Regional Planning A Systems Approach, (London, 1974) p. 63.

4 Although this statement is the reverse of the track session title, we feel that this is a more rational way of viewing the role of information technology in the planning function.

5 Michael Dennis and Susan Fish, Programs in Search of a Policy: A Profile of Low Income Housing in Canada (Toronto, 1973) p. 74.

6 Bingeman et al., "Residential Housing Study", produced by the Planning Secretariat of Cabinet (Winnipeg, 1973).

7 A. Regenstreif, "The Proposed Terms of Reference for a Study Concerning the Rehabilitation of Housing Prototypes in the City of Toronto." Project proposal for Acres Ltd., 1967.

8 Al Dakin, Harold Jackson, David Johns An Environment Motivated Plan for Multiple Resource Use along Highway 391 (Center for Settlement Studies, Winnipeg, 1973).

9 Barry Wellar describes this dialectic in his paper "Computer-Assisted Information Systems: Tools or Tinker Toys for Urban Governance" produced for the Federal Ministry of State for Urban Affairs, 1975, p. 7.

10 In a cursory study of our 1975 data, an imputed minimum family income figure for families wishing to buy a new single family house was $14,400. This, the lowest possible value for buying a new house is calculated from the principal interest and taxes times 4. It is based on the assumption that people spend no more than 25% of disposable family income on shelter. Figures from CMHC for 1975 show that about 36% of people earn more than this minimum figure.

11 B. Bingeman, G. Wichenko, "Progress Report on WHAP" (Staff Paper for HUD, 1975).

12 A. Dakin et al. "Systems for Regional Analysis, (SYSFRA) Manual" (Winnipeg, 1975).

13 Acres Limited, "Synagraphic Mapping, SYMAP, Users Manual Version 4." (Toronto, 1968).

14 "Social Goods and Services", Guidelines for the Seventies, Vol II (Winnipeg, 1973) p. 53. Published by the Manitoba Government.

15 B. Wellar, Op cit, p. 4.

16 City of Toronto, EXTRACTO - User's Guide (Toronto, 1974) Produced by the City of Toronto, Department of Finance.

17 Derrick Harrison, The Joy of GEORGE, City of Calgary, 1974 Produced by the Management Systems Development Department.

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## Role of Planning as Seen by Planning Function

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### Editor's Abstract

This paper develops a planning function perspective by means of briefly referring to several key items: the larger context of a complex and dynamic urban domain and disciplines with an urban bent; relationships between planning and other disciplines; bases and problems concerned with imbedding planning and information technology outputs in government organizations with their associated departmental and hierarchical biases.

### Résumé Préparé par le rédacteur

Ce document présente une perspective de la planification en traitant brièvement de plusieurs éléments clés: le vaste cadre d'un milieu urbain complexe et dynamique et de disciplines axées sur les questions urbaines; les relations existant entre la planification et d'autres disciplines; les principes sur lesquels repose l'implantation des résultats de l'informatique et de la planification dans les organisations gouvernementales; et enfin les problèmes que suscite cette implantation, à cause des préventions qu'ont les corps constitués à son égard.

## Introduction

The decade of the sixties was one of broad based research and experimentation in the urban information systems field. Borrowing from various disciplines, a new activity emerged, which concerned itself with the planning, design and management of the urban environment. This new activity might be called urban systems design. A convenient way to characterize this effort is to say that it is oriented toward a systems approach to computers. This approach is an attempt to view broadly and within a unified framework the processes of government and the use of information for decision making within those processes. It also views the usefulness of information technology in its potential contribution to improving the operational information and decision process in government. To achieve that potential, information is considered first as a part of government operating process and second as data to be handled.

## Urban Systems and Disciplines

The urban area is a complex and dynamic organism with many interacting systems. Some of these are service systems which comprise the framework in which our public and private human activities take place. The efficiency of these activities and consequently the quality of human life is both enhanced and/or restricted by the combined behaviour of many intricate components of the city.

To solve, predict future courses of action, and control these complex activities, descriptive and theoretical knowledge are drawn from a variety of professional disciplines and professions. The basic contributors to urban systems include planning, economics, mathematics, and the behavioural and institutional (law, government) sciences, as well as engineering technology. In this process, analytical methods, theories, descriptions of behaviour or urban systems and institutions and the use of quantitative methods are important.

## Planning Vis-à-Vis Other Problem-Solving Approaches

The planner is charged with the responsibility of carrying out his professional work within a discipline changing in response to the interaction with other professions. Other professional disciplines have been increasingly drawn into the field of urban analysis and with quantitative backgrounds find themselves from time to time in conflict with urban planning methods. At the other end of the spectrum is the urban process in which the creation of alternatives is largely an intuitive art. This planning method requires an individual or group with experience, training or talent and endowed with abilities to put things together in an effective way. It may be easy to recognize that what has been designed is relatively good, but the intuitive nature of the process makes it difficult to describe the reasons why the plan is good, the method by which it is created, or even how good it is.

## Imbedding IT Outputs in Institutional Change

There are some who argue that urban systems are largely counterintuitive and that they are so complex and their long term changes so interrelated that the human mind cannot possibly foresee and understand all these complex relationships.

Curiously, each of these two seemingly divergent approaches has value. Clearly, there is no substitute for human judgment but this judgment may be enhanced by allocating to the machine those functions it can do best. On matters of speed, there is no comparison and no competition; the machine is superior, and other things being equal, it should be used for those functions in which these assets are of predominant importance.

Fortunately, much is known about these three areas. Urban planning is taught in our universities; a body of useful knowledge has grown about quantitative analytical skills; and the basic technology of the computing engine is pervasive in western society. But, for the most part, the organizational structure of government with its strong departmental and hierarchical biases, does not favor the effective use of these three useful skills.

Those researchers, and others who tried to inegrate these skills in approaching the development of an urban information system, discovered that improvement of information and decision processes requires simultaneous improvement in several

related areas of the governmental system. The key reason for these parallel requirements is that, given the nature of systems, improvements must reach a critical mass in order to influence the overall working of the system.

## Conclusion

A systems approach requires improvements consisting of the integration of the information technology and the decision process; a realignment of the organization structure; an expansion of knowledge about information systems; altering the culture in which information systems are built; and finally the development of related personnel skills to effectively control and operate the system.

The challenge is to those who would resolve the conflict inherent in these different skills and technologies so that an effective and useful information system may be an aid to man and society.

# Role of Planning as Seen by Data Processing Function

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## Abstract

The observation, based upon experience with implementation of management systems in an operational environment, is made that the role of the planning function in the evolution of information technology is largely determined by the role which this function plays in the overall urban management process. This is in turn largely determined by positive stress elements in the organizational environment, and the nature of management response to this stress.

## Résumé

L'expérience acquise en matière de mise en oeuvre de systèmes de gestion dans une ambiance opérationnelle nous enseigne que le rôle de la planification dans le développement de l'informatique dépend grandement du rôle joué par cette même fonction dans le processus global de gestion urbaine. Ce mode de gestion dépend lui aussi en grande partie des facteurs auxquels on attache de l'importance au sein de l'organisation, et de la façon dont la direction les envisage.

## Introduction

The gist of the argument to be presented here is that the "market" faced by the information function as producer of an intermediate good is ultimately determined by demand on the part of local government for "planning". The discussion is organized in terms of structural and operating characteristics of both information and planning functions, major factors in planning function involvement, and specific areas in which the planning function influences the evolution of information technology. The paper concludes with some general observations on the role of the "planning function" and some conclusions of, hopefully, general applicability.

## Structure and Operating Characteristics of the Information Function

In the Calgary context, the information function involves the implementation of "management systems". This approach is based on two straightforward ideas:

(a) Data is a corporate resource, on a par with money, materials and personnel, and should be accorded the appropriate level of managerial effort.

(b) The end product of systematic data management is information useful and readily available to all levels of decision makers within the organization.

Further detail on the implementation of these concepts is contained in a companion paper in the Proceedings.[1]

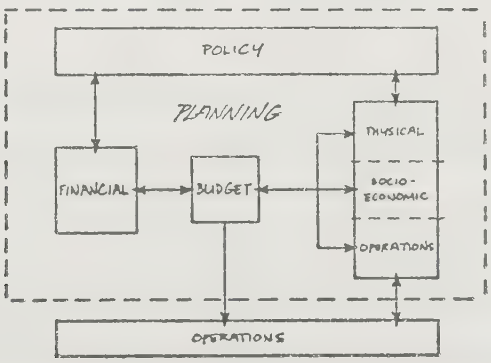


**Figure 1** Corporate Planning Function - Structure

## Structure and Operating Characteristics of the Planning Function

In structural terms, it is convenient to distinguish between several major sectors of the process: policy, financial planning, and physical, socio-economic and operations planning, as illustrated on the previous page.

This simplified diagram illustrates, in fact, the structure of the overall corporate administration, with appropriate emphasis on the planning functions, and with the corporate budget as a focal point. All of these sectors are interdependent to some degree, and any one sector may involve elements of all others.

In organizational terms, a city is comprised of a number of departments; e.g., Calgary has some 23 departments and subdepartments, a number of administrative boards and commissions and two school boards. From the consideration that several major planning sectors are involved, it is clear that the planning function is dispersed throughout the organization, in some areas quasi-autonomous, and in many instances closely associated with the operating functions. When the "policy" sector is considered, with all of its subjective political and administrative input, it becomes obvious that the one thing the "planning function" is <u>not</u>, in practice, is a unified single purpose mechanism with uniform information demands (qualitative and quantitative) at all levels.

## Major Factors Influencing "Planning Function" Participation

In Calgary, three factors have contributed to planning function involvement in information system development:

(a) The adoption of a planning programming budgeting system (PPBS) in 1972, with its emphasis on objectives and performance criteria for, and monitoring of, operating programs. This has fostered an increase in demand for all types of accurate and timely operational data and information.

(b) The emergence of active citizen participation in strategic planning (largely in the land use - transportation areas) has substantially increased the workload of this part of the planning function, largely through an explicit desire on the part of participants to see ranges of alternative solutions posed to problems.

(c) The civic administration has instituted a structured program of management development, with emphasis on modern behavioural sciences methodology, aimed at continuous improvement of managerial functioning.

### Specific Points of "Planning Function" Impact on Calgary's Information Technology

The impact of the "planning function" on development of Calgary's information technology has been characterized by a generally increasing level of interest in "new" data sources and data manipulation techniques. The impact of this awareness of the possibilities of useful application of information technology has resulted in the following:

(a) An increasing demand for information systems development on the part of all planning sectors, particularly those heavily involved with operating programs.
(b) A growing use of more sophisticated management techniques (e.g. automated production planning and scheduling, cash flow forecasting) over the past few years.
(c) A growing demand for the unstructured query capability and location and activity codes relevant to planning uses. Land use planners are participating in design of activity coding employed in new building assessment subsystems; applications of geographic data referencing techniques are becoming commonplace.
(d) Improvement of currently installed techniques is continuing. For example, projects slated for 1976 development in Calgary include futures approaches to forecasting, such as Delphi, etc., as supplements to more traditional trend forecasting methods.

It is of particular relevance to the topic under discussion to note that the vast majority of developments were initiated by the management of the organizational areas involved.

### Conclusion

On the basis of the Calgary experience, and with the aim of outlining factors governing "planning function" involvement in developing information technology, the following general observations are offered:

(a) The degree to which the planning function influences information systems development is positively related to the demands placed on the planning function by its environment.
(b) The degree to which the planning function influences information systems development corresponds to the attitude in planning sectors to innovation

and scope of analysis in <u>their</u> areas of concern.

(c) The manner in which the planning function influences information systems development corresponds to the level and frequency of information needs of the particular planning sector and its associated time horizons.

(d) The more closely associated the task of a planning sector with an operating function, the more likely it is to influence information systems development.

In general terms, the argument of this paper has been that the role of the "planning function", as defined, is largely detrmined by the internal and external environment of the organization of which it is a part. The obvious inference to be made is that moderate to high levels of environmental pressure to perform, lead to correspondingly greater demands for information technology on the part of "planners" and by administrators in general. In part, the pressures may be external to the organization; it can be argued that this is ultimately the case in any event. The manner in which the City of Calgary has responded to these pressures for performance has been basically the introduction of program budgeting and fostering of supporting technology and organization. To date, visible progress has been made in development of a workable corporate planning function, with this function influencing the development of local information technology in two fundamental respects:

(a) Focussing information technology on solving management- oriented problems; and

(b) Insistence (implicitly through expressed demands or explicitly through active participation) on development of the basic requirements of an integrated municipal information system: unstrucutred query capability, historical data series maintenance technology, standardized coding structures, and unique location identifiers.

While it is not claimed that the above points have universal applicability, certain of the points raised are undoubtedly applicable to other organizations, regardless of their style and circumstances, and have general applicability in the area of senior government policy formulation bearing on the encouragement of local level information technology.

# Rôle des services de planification: point de vue des services de traitement des données

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## Résumé

Les services de traitement des données s'attendent à ce que les services de planification s'impliquent complètement dans la construction de systèmes d'information propres à la planification urbaine. Cette implication sous-entend un investissement de ressources humaines, tant au niveau du développement qu'à celui de la construction des banques d'information. Elle sous-entend également que l'on accepte le fait que l'utilité et la rentabilité d'un tel processus ne peut s'accomplir qu'à long terme.

## Abstract

The data processing group expect planning departments to play a very extensive role in the development of an information system suited to urban planning. This implies an investment of human resources, in terms of not only the development of the system but also the construction of data banks. It further implies acceptance of the fact that the usefulness and profitability of such a process can only be demonstrated over the long term.

## Introduction

Le Centre d'informatique de la Ville de Montréal est l'unité administrative chargée de réaliser tous les travaux et les études relatifs au traitement de l'information par ordinateur. D'une façon plus particulière, son rôle consiste à assumer les travaux d'analyse, de programmation et de traitement, ainsi que toutes les recherches et études techniques s'y rapportant.

Le Centre d'informatique joue un rôle identique, sur une base de service, pour les services administratifs de la Communauté urbaine de Montréal.

Il occupe pour remplir ces rôles au-delà de 200 personnes et son budget annuel d'opération s'élève à quelque cinq millions de dollars.

L'origine du Centre d'informatique remonte à 1965. A ce moment, toutes les ressources humaines et financières réparties dans les divers services administratifs furent regroupées en une seule unité.

La majorité des travaux qui ont été réalisés depuis ce temps sont plutôt de caractère administratif et opérationnel.

Ainsi, les fonctions d'évaluation, taxation de toute sorte, billets de circulation et procédures judiciaires subséquentes, budget, comptabilité, permis, paye, gestion du personnel et plusieurs autres, ont été mécanisées.

Bien sûr, chacun de ces systèmes de traitement, en plus d'assurer la gestion courante des activités, comporte les outils propres à assumer la planification de ces mêmes activités.

Cependant, nous n'avons construit jusqu'à maintenant que très peu de systèmes axés principalement sur la planification et l'aménagement urbain. Dans ce sens, nous avons développé un système permettant l'étude permanente des causes d'accidents d'automobile et l'amélioration des règlements de circulation, ainsi que quelques autres systèmes du même genre (comme l'étude sur la pollution de l'air).

Il y a environ un an, nous avons développé un plan directeur des systèmes, dont un des objectifs vise à faciliter la planification de l'aménagement urbain en se basant sur les principes d'intégration des systèmes d'information à partir des softwares de gestion de banque de données.

Les commentaires que je peux formuler sur les rôles de services de planification dans l'évolution de l'informatique n'auront donc été éprouvés que partiellement jusqu'à maintenant; seule la banque générale d'information sur le cadastre a été implantée et est présentement en cours de rodage.

En résumé, on peut dire que le rôle des services de planification dans l'évolution de l'informatique s'exerce de multiples façons; cependant, nous avons tenu à les regrouper sous trois grandes appellations:

Participation des gestionnaires au développement des systèmes informatisés;

Utilisation des moyens technologiques avancés;

Construction des banques d'information.

Nous allons donc couvrir chacun de ces aspects dans les minutes qui vont suivre.

**Participation des gestionnaires**

Tous ceux qui, comme plusieurs parmi vous, ont été mêlés dans le passé au développement de systèmes de traitement des données ont connu l'époque où le mandat de concevoir et de développer un nouveau système était confié aux seuls spécialistes de l'informatique. Tous se rappellent les déficiences et les faiblesses de cette approche: entre autres, celle d'ignorer ou de minimiser l'apport permanent des gestionnaires et responsables des activités à réorganiser.

Dans le passé, cette approche a été rendue possible à cause de la nature des travaux à mécaniser: les connaissances et l'expérience des informaticiens leur permettent relativement facilement de concevoir de nouveaux systèmes pour des activités à caractère administratif, comptable ou statistique.

Cependant, lorsqu'il s'agit pour ces mêmes informaticiens d'élaborer des systèmes visant à faciliter la planification et l'aménagement urbain, l'importance de leurs connaissances est moindre: ils doivent recourir à l'aide des spécialistes en ces domaines.

L'élaboration de systèmes d'information propres à la planification et à l'aménagement urbain est donc venue confirmer une tendance déjà éprouvée dans certaines organisations, soit l'intégration à l'équipe de développement de personnes non spécialisées dans le domaine de l'informatique mais très au fait des caractéristiques de l'activité à développer.

C'est là, croyons-nous, un pas très significatif pour améliorer le processus de développement de tout système de traitement. Il annonce une décentralisation coordonnée des techniques de l'informatique, et favorise pour tout gestionnaire ou responsable l'accès aux outils nécessaires à son travail et à ses responsabilités.

La Ville de Montréal et son Centre d'informatique ont amorcé ce virage. Comme toute organisation de notre taille, nous avons connu l'époque où le Centre d'informatique se substituait aux responsables de certaines activités pour en améliorer ou moderniser le processus administratif.

Nous préconisons aujourd'hui le recrutement dans chacun des services administratifs de personnes connaissant à fond l'activité à réorganiser. Ces personnes, dégagées de leur fonction régulière, participent à chacune des étapes du développement du nouveau système et des nouvelles méthodes de travail. Il leur est également confié certaines responsabilités comme la définition des besoins, les essais du nouveau système, la formation du personnel, la préparation des procédures de travail et l'implantation.

Cette approche nous permet certes de développer des systèmes qui collent davantage à la réalité et qui répondent mieux aux besoins des utilisateurs.

Chez nous, les responsables des services de planification et d'aménagement urbain ont été l'élément moteur d'une approche décentralisée mais coordonnée du développement des systèmes d'information. Le jour n'est plus loin où ce processus permettra à chaque service de prendre en main la responsabilité complète du développement des nouveaux systèmes informatiques et de leur opération routinière, comme c'est le cas dans nombre d'autres activités.

## Utilisation d'une technologie plus avancée

Il y a quelque temps, le responsable d'un service administratif me signalait qu'il ne comprenait pas qu'une demande de travail formulée au Centre d'informatique soit aussi dispendieuse et que les délais nécessaires à sa réalisation soient aussi longs.

Après enquête, nous avons découvert que la demande formulée exigeait l'extraction d'information de trois filières physiques différentes, information qui devait ensuite subir un traitement spécifique. Nous avons également découvert que ce même responsable avait refusé, au moment de la conception des systèmes de traitement, qu'on prévoie une certaine souplesse permettant éventuellement de satisfaire des exigences non définies.

A combien d'entre vous semblable problème n'est-il pas arrivé?

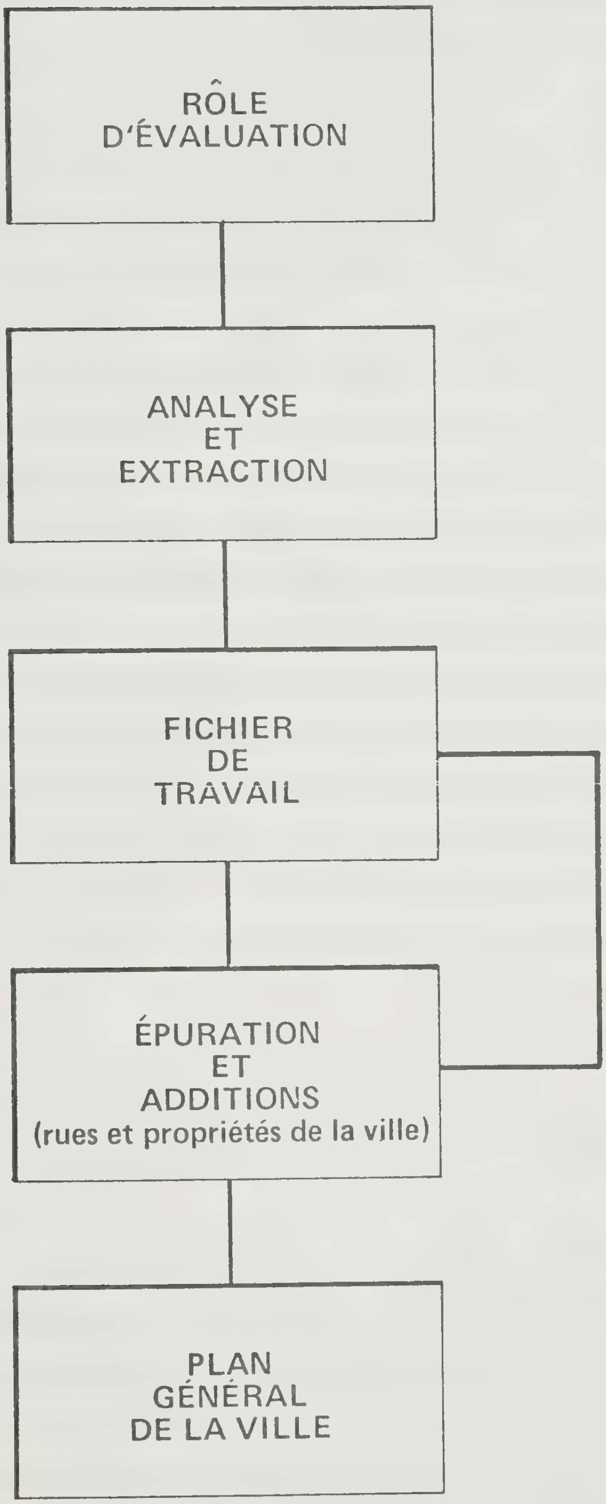


**Figure 1** Construction du fichier préliminaire pour le cadastre

Le futur utilisateur d'un nouveau système désire en limiter les coûts de développement et les délais d'implantation; cependant, il exige quand même des informaticiens qu'ils prévoient toutes les éventualités.

A cause des caractéristiques propres aux systèmes de planification et d'aménagement urbain, dans un cadre comme celui de la Ville de Montréal, nous nous devons d'utiliser des outils commes les softwares de gestion de banque d'information et un réseau de tété-informatique.

En effet, la masse d'informations à emmagasiner et à traiter, la nécessité de faire des relations entre des éléments d'information qui en soi sont étrangers, la possibilité d'ajouter des éléments nouveaux d'information en fonction de problèmes nouveaux sans pour autant rebâtir une filière séparée, toutes ces exigences sont des fonctions que l'on retrouve dans la majorité des softwares de gestion de banque d'information.

Ces softwares qui, bien qu'encore imparfaits et incomplets, répondent à ces exigences, pourront, au fur et à mesure de leur progrès, faciliter davantage la réalisation de tous les besoins propres aux fonctions de planification et d'aménagement urbain.

La réalisation de ces systèmes aura été l'occasion d'expérimenter les softwares de gestion de banque d'information et de reconnaître leur utilité pour le développement de tous les systèmes de traitement, y compris ceux orientés vers les fonctions d'exécution.

**La construction des banques d'information**

Les coûts de construction d'une banque d'information sont très élevés. Pour une ville comme Montréal, ils sont énormes.

Quand on sait que ces banques d'information, à leur début, ne rendent que des services très limités, plusieurs hésitent à reconnaître leur rentabilité; les bénéfices n'en ressortent que lorsque les informations emmagasinées sont de plus en plus complètes et valides.

A priori, les services administratifs acceptent très mal l'idée d'encourir des frais élevés pour une activité dont ils ne retireront que peu de bénéfices.

Ils hésitent également beaucoup à utiliser une information dont ils n'ont pas la responsabilité complète.

Une collaboration et une coordination de tous les instants entre tous les services administratifs sont essentielles au succès de la construction d'une banque d'information de qualité.

Chez nous, les services de planification et d'aménagement urbain ont sollicité la collaboration de plusieurs unités de travail. Cette collaboration a permis la construction de la base de notre banque d'information sur les terrains.

Actuellement, les efforts de plusieurs unités de travail sont requis, sans qu'on s'attende nécessairement à retirer un bénéfice ou des avantages à court terme.

A long terme, tous les systèmes d'information, même ceux propres à la planification, seront conçus en fonction de cette banque d'information.

Nous éviterons ainsi la redondance de certaines informations; nous faciliterons la signification et la compréhension de l'information et de sa codification. L'information sera plus complète, mieux validée.

Tous les services pourront tirer bénéfice de ces avantages. Les services de planification et d'aménagement urbain auront compris, les premiers, que le processus de planification est nettement amélioré s'il s'appuie sur des systèmes d'information efficaces et de bonne qualité.

Ils auront permis à tous les services de bénéficier de ces avantages, grâce à leur vision à long terme.

**Conclusion**

Les services de planification et d'aménagement peuvent donc remplir trois rôles principaux qui permettront à l'informatique de mieux répondre aux demandes de tous les services:

Participation entière des gestionnaires dans le développement des systèmes;

Recherche dans l'utilisation d'outils plus souples et appropriés;

Construction de banques d'information.

En conclusion, permettez-moi de vous expliquer, pour illustrer les principes que je viens d'énoncer, le cheminement de l'information qui a été suivi par la Ville de Montréal pour constituer l'élément de base de sa banque d'information sur le cadastre. Dans le futur, nous pourrons ajouter à cette base toutes les informations nécessaires à une bonne planification et à un aménagement urbain de qualité.

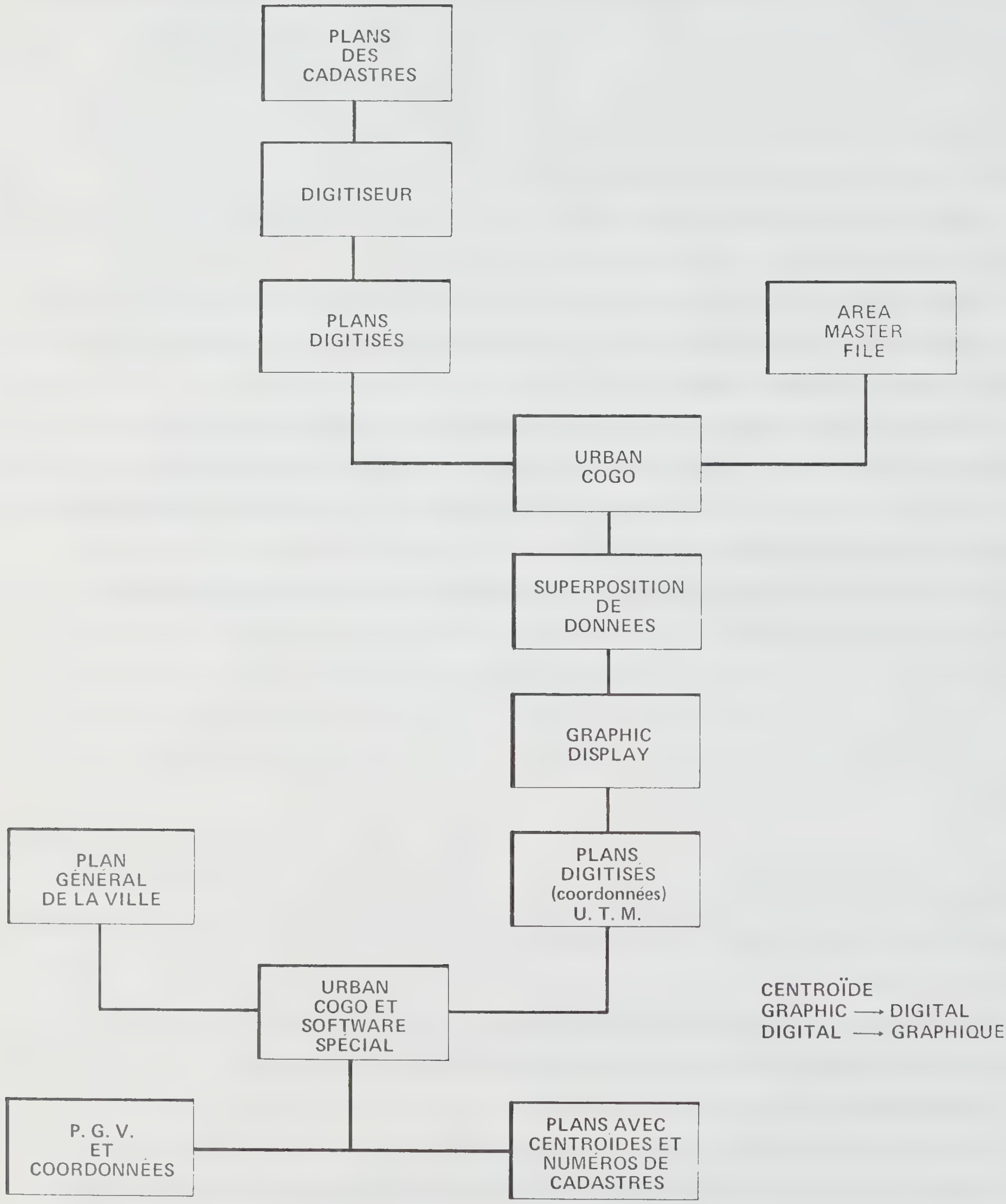


**Figure 2** Addition au cadastre des coordonnées géodésiques

**Table 1** Description générale des informations du cadastre

LES DONNÉES DU PLAN GÉNÉRAL DE LA VILLE SONT GROUPÉES DANS SIX FAMILLES

**A) Identification du lot**

1- DIVISION CADASTRALE
2- LOT ORIGINAIRE
3- SUBDIVISION, RESUBDIVISION OU RE-RESUBDIVISION
4- INDICATIF DE PARTIE
5- ADRESSE DU LOT

**B) Identification du propriétaire d'un lot**

Ces données sont constituées du nom et de l'adresse du propriétaire d'un lot.
Cette information permettra d'entrer rapidement en communication avec ledit propriétaire.

**C) Renseignements sur la ou les propriété(s) sise(s) sur un lot**

Chaque lot sera porteur de son numéro de compte de taxe respectif. Le numéro de compte nous permettra d'accéder aux données du rôle foncier, emmagasinées sur microfilm. Ces données nous fourniront d'innombrables renseignements sur les propriétés dans la Ville de Montréal.

**D) Renseignements additionnels sur la constitution d'un lot**

Avec l'accès direct, les renseignements suivants seront très utiles:

1) SUPERFICIE DU LOT
2) QUARTIER MUNICIPAL
L'inscription du quartier municipal permettra d'extraire les données à l'intérieur d'un quartier municipal désiré.

**Table 1** Description générale des informations du cadastre (suite)

**E) Renseignements sur les événements affectant un lot**

1- GENRE DE COORDINATION

Indique si sur un lot donné, il y a expropriation, homologation ou autre ou même un avant-projet.

2- NUMÉRO DE COORDINATION

Réfère directement au dossier de coordination.

3- NUMÉRO DE VOLUME DE PROPRIÉTÉ

Indiquer ou retrouver un lot dans le volume des propriétés

4- NUMÉRO DE PLANS ET PROFILS

Permet de retrouver un lot sur les plans de Plans et Profils. De plus, connaissant les affinités de ces plans avec les plans de photographie aérienne mieux connus sous le nom de plans de 100 pieds au pouce, ceci nous permet de répondre aux besoins topographiques des usagers du Plan Général de la Ville.

5- NUMÉRO DU DISTRICT ÉLECTORAL

Constitue un élément très intéressant lorsque nous est offerte la possibilité de connaitre la valeur des travaux exécutés à l'intérieur d'un district électoral.

NOTE:

Ces données seront inscrites par les préposés aux entrées de la section Plans et Archives.

**F) Éléments pour faciliter le développement d'une méthode de recherche**

1- CODE D'EMPLACEMENT

Ceci nous fournira une façon de retrouver un lot d'après sa situation sur une des rues de la ville. De cette façon nous retrouverons un lot par son numéro civique et sa rue; nous aurons même la possibilité de le retrouver par une simple description de l'emplacement.

2- COORDONNÉES GÉODÉSIQUES D'UN LOT

Ceci nous permettra de situer un lot sur la description géographique de la ville.

# Rôle des services de planification: point de vue de l'administration

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## Résumé

Dans cet exposé, l'on aborde le rôle de la planification dans le cadre des petites villes et des villes de taille moyenne. D'un certain point de vue, ce service est primordial, aux yeux de la direction municipale, pour l'orientation des applications informatiques. C'est lui qui le premier peut voir les besoins globaux de la municipalité, et déborder les services traditionnels d'informatique municipale que sont la paie, les comptes à recevoir et les autres applications du domaine comptable. C'est lui également qui peut entrevoir la nécessité d'un rapprochement avec les autres localités pour favoriser un développement harmonieux et aider à la régionalisation des services. La planification forcera donc les municipalités à se doter d'outils informatiques et analytiques capables de fournir les données nécessaires sur l'environnement, les infrastructures, l'utilisation du sol, l'habitation, etc.

On cite en exemple une municipalité du Québec, St-Jérôme (au nord de Montréal), où le service d'aménagement joue un rôle prépondérant dans l'orientation de techniques informatiques évoluées.

## Abstract

This paper discusses the role of planning within the context of small and medium-sized cities. Municipal administrators consider this activity to be of major importance in finding new uses for data processing. It is the planners who are first able to see the overall needs of the municipality and go beyond the traditional municipal uses of data processing: payroll, accounts receivable and other accounting functions; it is also the planners who are more likely to perceive the need to join in with other communities in a balanced development effort and to assist in regionalizing services. Planning will force municipalities to acquire the analytical and data processing tools that are capable of providing the necessary information regarding the environment, infrastructures, land use, housing and so on.

The municipality of St-Jérôme, Quebec (north of Montreal) is presented as an example of a community where the planning department is playing a major role in the development of sophisticated data processing techniques.

## Introduction

La planification municipale est à la mode, surtout dans les grandes villes nord-américaines, mais il serait un peu naïf de croire qu'elle se pratique à grande échelle sur le continent. De plus, ce terme aura différentes résonances selon que l'on considère une municipalité située dans une province ou dans une autre, et peut-être plus encore si l'on envisage la taille de cette municipalité. Je situerai donc cet exposé au Québec, et limiterai mon analyse aux villes de petite taille ou de taille moyenne, soit de 5 000 à 50 000 habitants et de 50 000 à 150 000 habitants.

En première partie, j'aborderai l'état actuel de développement de l'informatique dans ces municipalités; en deuxième lieu, je parlerai du rôle d'avant-garde que peuvent et doivent jouer les services de planification; enfin, je donnerai un exemple du rôle joué par l'un de ces services dans l'orientation de techniques informatiques évoluées, au service d'une municipalité du Québec.

## Développement informatique dans les villes de taille petite et moyenne

Au Québec, on retrouve actuellement environ 130 municipalités de petite taille dont 35 de 20 000 à 50 000 habitants, et à peu près 10 villes de taille moyenne. Si l'on veut être réaliste, on doit affirmer que le développement informatique dans les municipalités du Québec est à un stade très peu avancé. Dans une trentaine de municipalités, on retrouve des mini-ordinateurs de la catégorie du système 3 de I.B.M. et ailleurs, on n'utilise que des machines comptables conventionnelles et quelques systèmes comptables plus évolués. La plupart des opérations effectuées par les municipalités, pour ne pas dire toutes les opérations, sont de type comptable (paie, comptes à recevoir), et peu de municipalités recherchent des applications pouvant mener à des analyses plus poussées des opérations municipales et à la planification urbaine en général.

D'autre part, un bon nombre de municipalités font appel à des services extérieurs pour tout ce qui touche le traitement électronique des données, et ceci même pour des travaux assez complexes.

## Les services de planification et de développement, et leur rôle d'avant-garde

Même s'il ne se fait pas de planification sur une haute échelle et d'une façon généralisée dans toutes les municipalités, il n'en reste pas moins qu'il existe, dans la plupart des villes de taille moyenne et même petite, des services dits de planification ou d'aménagement. Et ces services prennent de plus en plus d'importance, aux yeux de l'administration municipale, dans l'orientation des ressources socio-économiques d'une municipalité. Ce sont ces services qui ont le plus de chances de jouer un rôle prépondérant dans l'orientation des applications de l'informatique au niveau municipal. Ce sont eux qui vont aider les municipalités à réaliser que pour bien développer, pour rénover, pour annexer les localités voisines, il faut plus que les fichiers des noms et adresses des payeurs de taxes. Ce sont eux qui vont pousser les municipalités à construire des bases de données convenables (sur l'utilisation du sol, les infrastructures, la qualité des bâtiments), et à mettre au point (ou à faire développer) des modèles d'analyse adéquats pour leur permettre de prendre les décisions d'orientation les plus réalistes. En un mot, l'administration municipale peut bien sûr orienter l'évolution de l'informatique dans sa localité, mais elle s'appuiera en grande partie sur un service qui déborde les préoccupations courantes de l'administration interne des services financiers et techniques, et qui pense même en termes de régionalisation.

## L'exemple de la Municipalité de St-Jérôme

Dans cette troisième et dernière partie, je vous entretiendrai d'une expérience, unique au Québec, de développement d'applications informatiques pouvant mener à des analyses très poussées de la situation municipale. Il s'agit de la mise en place du système d'information à référence spatiale de St-Jérôme, ville d'environ 30 000 habitants, située près de l'aéroport de Mirabel, au nord de Montréal. Le système a été mis sur pied grâce au Ministère des Affaires municipales du Québec, en étroite relation avec le service d'aménagement de la ville de St-Jérôme. La réalisation technique a été confiée au Centre de recherche en aménagement régional de l'Université de Sherbrooke, qui se spécialise dans le développement de tels systèmes.

Le système de St-Jérôme est composé de trois (3) grandes parties:

1 La base géographique qui a pour rôle de représenter la réalité spatiale et de

permettre des traitements et des représentations cartographiques en fonction de tous les regroupements et interrelations possibles entre les éléments de cette réalité, à partir du lot, de la façade d'îlot, d'îlots, de quartiers, de secteurs de zonage et autres... Les principaux fichiers de cette base sont ceux des propriétés, des segments de rues, des façades d'îlot et celui des secteurs d'intérêt.

2 La base de données qui pour sa part est constituée d'un ensemble de fichiers interreliés regroupant les données suivant les types d'activités de la municipalité.

Deux (2) types de fichiers sont développés jusqu'à présent. Le premier comprend les données des propriétés, servant au rôle d'évaluation, à la perception, aux analyses d'utilisation du sol et à l'urbanisme; le deuxième comprend les fichiers relatifs aux infrastructures: données du réseau routier (revêtement, longueur et autres caractéristiques des voies publiques et des trottoirs); données des réseaux hydriques, telles que les dimensions des tuyaux d'égout et d'aqueduc, la profondeur, ainsi que des informations sur les éléments hydriques.

Un troisième type de fichiers est en cours d'élaboration: il concerne tout le domaine de la gestion financière de la municipalité.

3 Le module de traitement comprend une série de programmes servant à la mise à jour des différents fichiers ainsi qu'à l'établissement de liens fonctionnels entre les divers fichiers de la base de données et ceux de la base géographique. De plus, ce module renferme un ensemble de programmes servant à effectuer les regroupements nécessaires aux analyses de situations précises et à la reproduction cartographique automatique des résultats. Parmi les applications qui peuvent être tirées d'un tel système, qu'il nous suffise de mentionner quelques-unes qui ont été réalisées: tracé automatique du réseau routier avec nom des rues et type de revêtement, tracé des trottoirs en fonction du type de revêtement, configuration des réseaux d'aqueduc et d'égout avec représentation des éléments, répartition des propriétés par secteur de zonage, répartition des lots vacants, calcul des longueurs des voies pavées, répartition de la population par façade, répartition des valeurs de propriétés par rue, nombre de logements par îlot, répartition de la population par rue et par secteur de dénombrement. Voilà un petit échantillon des applications possibles, qui donne un aperçu des capacités du système.

## Conclusion

Le développement et l'évolution informatique au palier municipal sont entre les mains des services de planification, qui se doivent d'orienter les efforts des municipalités vers l'utilisation de systèmes intégrés d'information urbaine et même régionale. Souhaitons que toutes les municipalités se dotent de services d'aménagement et de planification aussi dynamiques que celui de St-Jérôme qui, encouragé par l'intérêt du ministère des Affaires municipales, a su tirer profit d'un outil puissant et a contribué à orienter les applications de l'informatique dans le domaine municipal. Souhaitons enfin que d'autres expériences de mise en place de systèmes d'information urbains à représentation spatiale soient entreprises.

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**Abstract**

This paper shares some of the author's views on planners and planning in the evolution of information technology. It concludes that planners have not been well enough informed (educated in computer systems), have not been particularly concerned and therefore have not done enough.

**Résumé**

Le présent document présente les vues de l'auteur sur les planificateurs et la planification par rapport à l'évolution de l'informatique. Il conclut que les planificateurs n'ont pas été suffisamment sensibilisés à l'informatique (i.e. n'ont pas reçu assez de formation pertinente), qu'ils ne s'y sont pas particulièrement intéressés et que, par conséquent, ils n'ont pas déployé assez d'efforts en ce sens.

## Introduction

This paper deals with the role of the planning function or planners in the evolution of information technology from an operational point of view. The opinions expressed are those of the author and do not represent, necessarily, those of the organization of which I am a part. They are based on experience, primarily with land use planners, over the past half dozen or so years and the difficulties that I have encountered in dealing with and attempting to satisfy the needs of planners.

My responsibility is for a large geographic information system that has as one of its objectives: to present data in a form required for land use planning at the local, regional, provincial and national level. My background combines data processing experience and an involvement with planners at various levels.

## What is Planning?

A plan is defined as a way of proceeding. It is a detailed program of action that always implies mental formulation and sometimes graphic representation. Planning is the act of arranging the parts. A planner is one who makes plans. Thus can it be concluded that a planner is the one who provides the guiding light? He is the thinker, the intellectual, the person that is going to resolve and solve the problems.

## What is Operations?

An operation is a doing or a performing of a practical work. It is the quality or state of being functional. Thus workers are the doers. They are the people that actually put into action the plans of the planners. They are the people that provide information to the planners to enable them to formulate their plans. All too often operations people look upon planners rather negatively and regard their function as somewhat menial and non-productive once the final result (plan) is complete.

## Let's Go Back to Planners

Planners are concerned with change. They are not interested in static information as such. It is interesting only when it can be related to time series data. They are interested in the interactions between static and dynamic data.

Planners are concerned with the delivered product. They are not generally interested in the process of generating the results. Most planners are not computer systems specialists and become lost in the discussions of systems.

Their concern is with data's authenticity, accuracy, date, location, etc. The data must be capable of being tested against the real world and surviving in order to retain the confidence of the users (planners). Generally the systems that produce the data stand or fall with it. The user must have confidence in the data and the system.

On the other hand, all too often planners do not define well enough (or at all) their goals or objectives. A goal or an objective is the end to which effort is directed. However, all too often, the direction, the goals, the objectives, the aim of the project or projects is not transmitted to operations. Operations flounders by not having sufficient and adequate guidance or direction. The planner may define his goals and objectives but they are not transmitted to those who need to know. The question is then: "Do planners have adequately defined goals and/or objectives?"

There is often a lack of understanding and communication between the two groups. Clearly they speak the same language (sometimes) but they use different definitions. The result is that the delivered product is what was asked for but is not what is wanted. Again, planners are not computer technologists. They do not speak the language. Planners in general are not well educated in the use of computer systems.

At this stage we can ask: "Do planners know what they are doing?" The answer. Planners do not know what they are doing. Possibly that is a bit too strong. However, from our point of view that is what we see. For "proof" let us consider a report that surveyed users of land related information i.e. land use planners.[1] It is a report of a provincial government agency. The report is based on questions that were asked before and after the demonstration of an on-line interactive retrieval system. About two to three hundred land use planners were given an opportunity to review and test the system. Of those, about 100 responded to a questionnaire.

In response to the question: "What questions or problems were you addressing?",

the report concluded that the results were so scattered in concept and scale that a meaningful data reduction appeared infeasible. The question appears straightforward and simple. Does that mean that the planners did not know what questions or problems they were addressing? Or does it indicate that there was too broad a subject range. There were 71 answers from 75 respondents.

The response to the question, "Did you have computer assistance for any of the analysis or presentation or data storage and retrieval?" was (in percent):

| | | | |
|---|---|---|---|
| Yes | 24 | No | 62 |
| No Response | 12 | No Perceived Need | 22 |
| Lack of Resources | 40 | Lack of Knowledge | 30 |

No Response Indicated 35

Does this mean that one third of the planners who responded "no" did not know why they responded "no"?

Another study conducted on behalf of the Lands Directorate, Environment Canada by Dr. B. Massam, McGill University, was an evaluation of Geographic Information Systems with special reference to the Canada Geographic Information System, the users viewpoint.[2] If we can consider geoinformation systems to be another example of information technology, then the comments that I am going to draw from this report are valid and applicable in general to information technology. The report was based on interviews with a selection of individuals concerned with a variety of contemporary land planning problems.

From that report I offer some comments:

Information technology itself will not solve problems.

Planners claim data is bad - but do they give adequate feedback?

Information technology should be incorporated in the planning process.

Planning is concerned with the defining and choosing among alternate courses of action.

The author defined the planning process as follows:

1 Recognition of the problem.

2 Definition of the goals and aims.

This item is clearly most important. Without a clear definition of the goals, operations, data processing, management, do not know where the project is going.

3 Alternatives - the presentation of alternatives.

4 The evaluation.

The author asked: "Are computers used in policy making?" The response, "At best computers are occasionally used to help in the preparation of material which in turn is used by planners and others to write reports". Generally the planning community has not been keen to make great use of computers.

The author commented that planning schools in Canada have not developed a strong reputation for teaching about GIS (Information Technology).

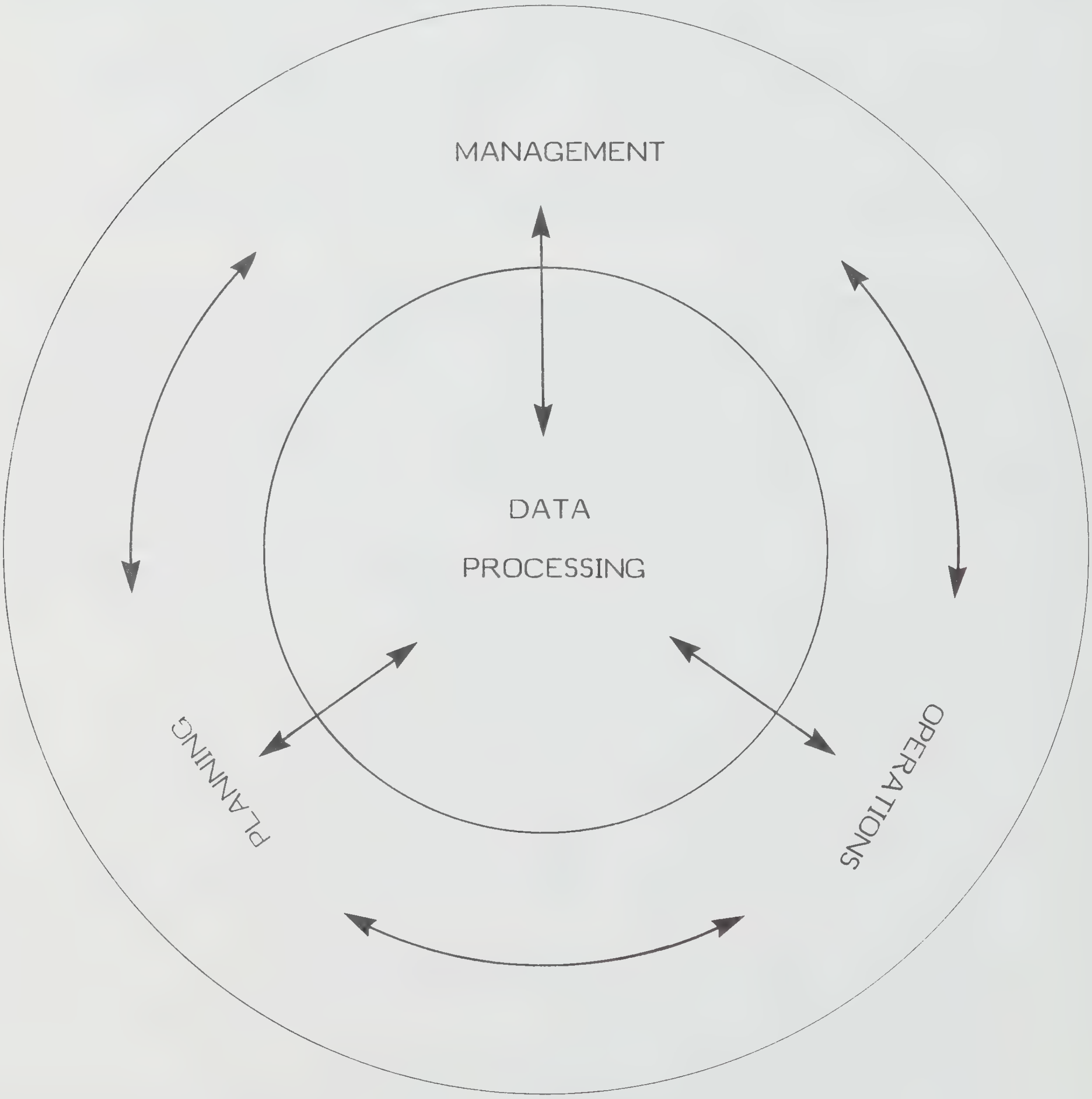


**Figure 1** Operation and Interaction of four functions

## Question

The question that has to be answered is: "What is planning doing with respect to the evaluation of information technology at the .......... level?"

The answer is simple. Not enough! The comments that I have made, aimed at the planning community, are really comments that can be made of operations, of management and of the data processing community as well. Without involvement from all sectors, we will not meet objectives.

Figure 1 represents the four functions operating in harmony with interaction between all. The data processing group is placed in the middle since it is a service oriented function to provide services for the other groups. If any of these groups chooses to abdicate its responsibility and involvement, then we will not have harmony in the development of information technology. Again, what will be produced will be what was asked for but not what was wanted.

## Conclusion

To close let me quote from Dr. Massam's report: "A GIS (example of information technology) for land use planning is only as good as the level of financial support it receives for development costs and operating costs, the technical competence of the hardware and software of the system, the nature of the data available, and perhaps most important the level of confidence by the planners, <u>the degree of integration of the GIS in the planning process</u> and the enthusiasm of the personnel. <u>The management structure for controlling GIS should encourage input from all these quarters.</u>"

**Notes**

1 CLI on Computer, A Test and Demonstration, The Questionnaire Results, 1976.

by: B.A. McGee
P.L. Precht — Interdepartmental Relations Division
J.P. White — Systems and Computing Branch
R.M. More

Environmental Coordination Services
Alberta Environment
10040-104 Street
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T5J 0Z6

2 An Evaluation of Geo-Information Systems with Special Reference to the Canada Geographic Information System: The Users Viewpoint.

B.H Massam
Urban Planning
McGill University

February 1975.

# Role of Planning as Seen by the Operations Function

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## Abstract

This paper defines a new relationship between the planning and operations functions in local government. Following a review of existing problems and causes, the paper suggests that basic changes in the planning process should include: a plan system consisting of Policy, Local and Corporate Plans; a major coordination and integration role for planners; and an organization for planning in local government, where the continuity of the planning process, and the need to integrate the work of many more disciplines and the interests of numerous groups and individuals are the basic principles.

## Résumé

Le présent document définit une nouvelle relation entre la planification et l'exploitation au niveau municipal. Par suite d'une étude des problèmes actuels et de leurs causes, le document laisse entendre que des changements fondamentaux devraient être apportés au processus de planification. Ces changements devraient comprendre: l'établissement d'un programme comportant des plans relatifs aux politiques, aux problèmes des secteurs et à l'ensemble de la région; un rôle important de coordination et d'intégration pour les planificateurs; et l'organisation de la planification au palier municipal, qui devrait permettre la continuité du processus de planification et susciter le besoin d'intégrer les travaux de plusieurs autres disciplines et les intérêts de nombreux groupes et individus.

## Introduction

In most cities today there is little contact between the planners, (those who prepare "master plans") and the operations personnel. Before the role of information technology can be discussed, we must review the present relationship between these functions, identify the weaknesses in the relationship, and explore ways of overcoming these problems.

## Planning - Operations Relationships

Despite a long tradition of urban planning in Canada, there is little effective communication between the executive, master planning, program planning, and program delivery functions. In most cities the many branches of government operate independently of the planning function.

A number of major problems are caused by this situation. There is little relationship between the provision of "master plans" and the services delivered by operating departments. Some operating departments work at cross purposes or duplicate each other's services. Once established, most programs go on indefinitely. Amendments are made to "master plans" with little understanding of their affect on existing programs or the basic concepts of the plan. Many urban services are provided in a planning vacuum because "master plans" deal with only a few topics directly related to land use policy. Many plans are ignored because they are unrealistic.

There are a number of factors which contribute to the problems outlined above. Government now provides many services previously available only from the private sector or not available at all. Traditional planning and service delivery procedures were devised to provide only a few basic services with clearly defined limits of responsibility. As the number of government services increased, so did the need for programs for planning, coordination, and evaluation. Unfortunately these programs have not been developed in most of our cities; the major reason being the inflexibility of the traditional hierarchical organization illustrated in Figure 1.

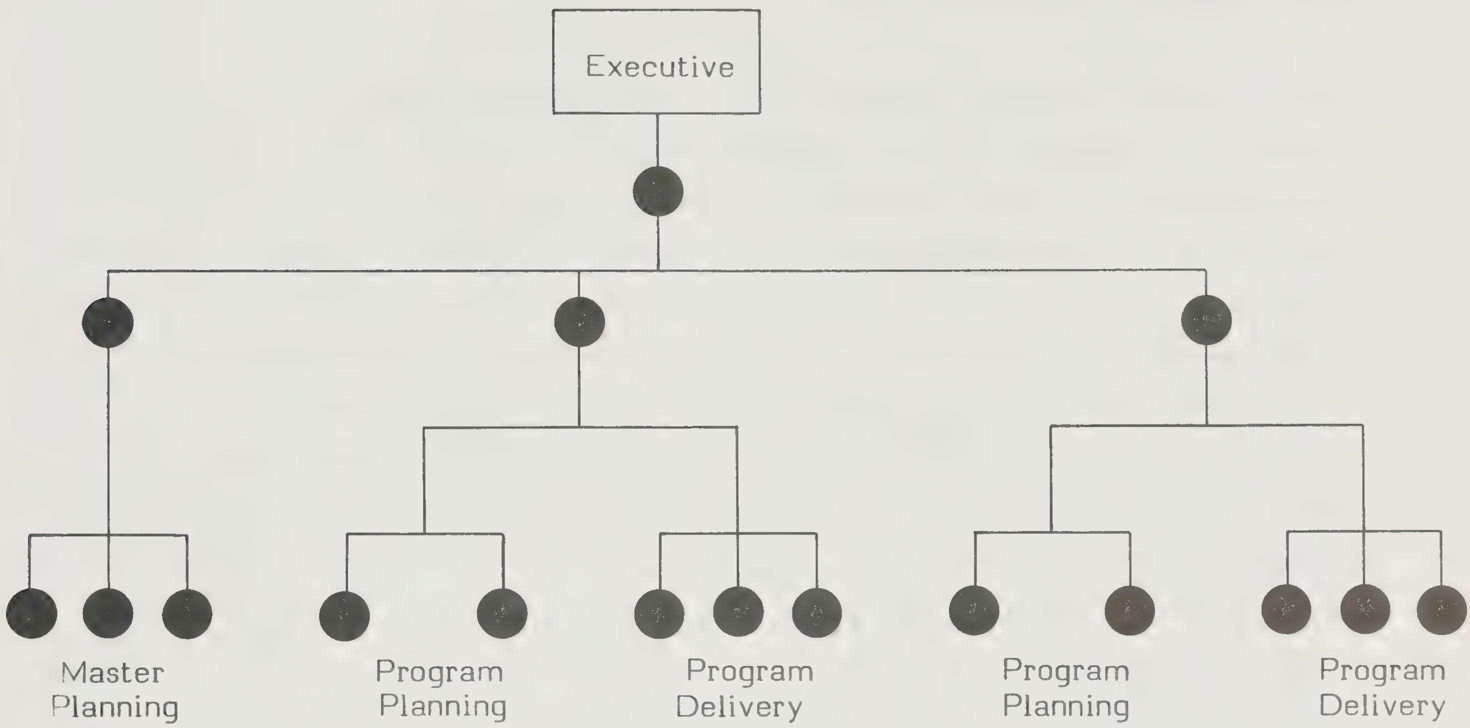


**Figure 1** Traditional Hierarchical Organization in Canadian Urban Planning

This is reinforced by the tendency for most senior personnel to be specialists in a single discipline. The nature of the newer services is such that there is a greater likelihood of them overlapping or working at cross purposes. The values of society are changing quickly and urban systems have become so complex that no one person or discipline fully understands how they work or the impact of changes in policies and programs.

No doubt there are other factors that contribute to the problems identified in the first few paragraphs; however, the ones just presented appear to be the most important. The nature of the factors presented above suggest that we should be developing ways of coping with our more complex and faster changing society, rather than trying to reverse the present trends.

## Functional and Relationship Changes

Three possible changes in the planning function and its relationship to operations functions are outlined in the following paragraphs. The basic principle underlying these proposals is a more comprehensive planning process that can deal with a broader range of policies and programs, and be more responsive to changes in attitudes of the public. Implementation of this concept would require the introduction of a plan system which is new in form, content, and procedure; a complete restructuring of local and regional planning organization; and a new role for planners.

The new plan system would consist of Policies Plans, Local Plans, and Corporate Plans. Policies Plans would be concerned with the physical, social, and economic systems of the region in so far as they are subject to physical control. Policies Plans would interpret federal and provincial policies, establish aims, policies, and major proposals for the region, and bring regional planning issues before the provincial government and the public. In addition, Policies Plans would provide a basis for coordinating decision making for the region, indicate areas needing intensive action in the near future, and provide general guidance for development control.

Local Plans would be prepared for any area in the region requiring refinement of the Policies Plan. The major functions of Local Plans would be to apply in detail the strategies adopted in the Policies Plans, provide a detailed basis for the coordination of public and private development, bring local and detailed planning issues before the public, and provide a detailed basis for development control. Local Plans, in conjunction with strong development agreements, would replace present day zoning practices.

Corporate Plans would ensure that all functions of regional and local government work in complementary ways towards the achievement of common goals and compatible objectives. When Corporate Planning is strongly established, the Policies Plans should be part of the Corporate Plans. For now, the main tasks of Corporate Planning will be to create social and economic plans and ensure that they are integrated with the spatial aspects of Policies Plans.

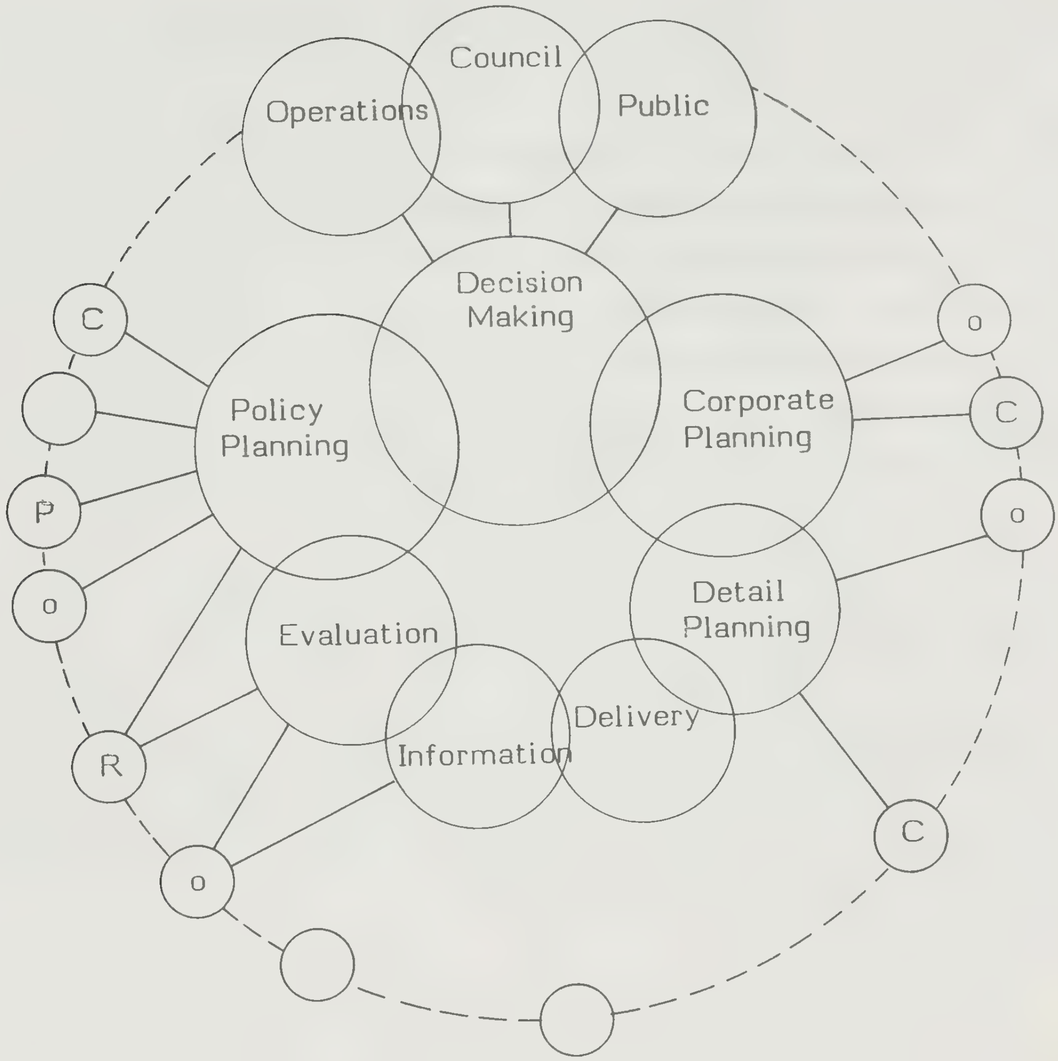


**Figure 2** City Management: Participative Decision-Making Process; Planning a Management Function

## Conclusion

The organizational requirements of a planning system such as the one outlined above can not be met by most local and regional governments in existence today. A whole new approach to government organization for planning is required. Figure 2 illustrates an organization for planning where the continuity of the planning process

and the need to involve many more disciplines and interests in planning are the basic principles. The management of cities would be shifted away from command and production principles of control to a more participative decision-making process in which planning would become a management function in its own right.

The role of the planner in this new planning process is to coordinate and integrate the efforts of the many new participants in planning. He must help define the problems, break them into their constituent parts, coordinate the investigation, and then integrate the findings in a form suitable for public review and decision making. Furthermore, the planner must monitor and report upon the impact of the decisions taken, and make recommendations for modifying policies, plans, and programs.

In the future, planning will require a broad understanding of the community and its systems as well as the political and operational environment in which policies, plans, and programs must be carried out. Planning will have to use the most advanced tools for the management of information, the analysis of urban systems, and effective communications between numerous groups and disciplines. Planning will not be easy. However, it is imperative that it be done, and done well, if our cities are to be managed effectively and responsively.

Rapporteurs' Report

## Discussion of Track Session C - Role of Planning Function

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The most significant outcome of the track sessions is the observation that a sizeable gap exists between planners and management information specialists. This contention is based upon the comments made by the presenters as well as members of the session in the ensuing discussions. During the past two days arguments have been made that the planner is an intuitive, seat of the pants individual whose disposition is nontechnological.

The presentation of Winnipeg's Housing Analysis Package underlines this point. In discussing the information base with planners, the Winnipeg people found that planners displayed confusion regarding the housing packages. Planners could not appreciate the need for data file comparability. Secondly, the planners expressed little interest with the system in general. Similar incidences outlining the planners' lack of understanding and commitment to information systems, were presented during the course of the sessions. The planners' perceptions and evaluation of these information systems need to be examined if we are to form an alliance between planners and information specialists. However, before we can develop the much needed strategy for closing this gap, we need to discuss the factors which caused it to develop.

The information technology profession, like that of engineering, medicine, and to a lesser extent planning, has developed around a body of methodological skills or tools. This methodological orientation can be contrasted to what could be called a problem orientation. This distinction prompts the question: Do management information specialists search for problems or issues to which they can apply their tools, or do they develop tools which can be utilized to effectively resolve problem issues? From the course of the sessions it appears that in fact the tool kit orientation is the prevalent inclination of the information specialist, and that the dialogue between this group and the planner is somewhat truncated. To quote Michael Teitz:

> The effectiveness of methods in solving problems, the tendency to specialize on just those problems, and the investment of effort needed to learn the methods at a crucial time in an individual's self-development, all suggest that the method holder may increasingly perceive and interpret the world through the lens of his or her particular skills. In this sense, method becomes the organizing basis for a world view. Again there are limits to this view. It is simplistic and minimizes the importance of other factors that shape perception of events and situations.... In a larger view, method epitomizes a way to perceive the world that is unique to a particular professional group. It is their means of cognition as well as their means of problem solving.[1]

Teitz's last point raises another very interesting issue. Are there fundamental differences in the cognitive orientation displayed by information specialists and planners towards urban problems?

Information systems management has developed in response to the expressed need to provide decision makers with concise, timely, and relevant information. On the other hand, the urban planner is becoming increasingly involved in a series of complex issues, one of which is the area of citizen participation. Here the conceptual issue is to develop processes which will enable citizens to actively shape urban public policy. Clearly these are two divergent orientations. It should be mentioned that this issue of citizen access to management data systems, as well as individual privacy was the focus of a lively discussion during the first track session.

During the course of this discussion it was interesting that no mention was made of the potential transfer of technology into the area of citizen participation. The use of interactive devices has proven quite successful in aiding citizens to develop an appreciation for the costs or trade-offs of their choices regardless of how constrained their terms of reference. These interactive capabilities can be utilized to educate citizens about the ramifications of various public policies just as easily as it can inform public officials. This gap between the state of the art of computer technology and planning may be due to the conceptually different way in which both professions approach urban problem solving and governance.

Even if the conceptual differences can be bridged there still remains the question of methodological compatibility. Many of the presentations at the session, as well as this conference, emphasized the financial aspects of urban governance.

In the light of the New York situation as well as the general austerity program at the federal level in Canada - sound urban financial planning is of utmost importance. Unfortunately, many urban planners are embarrassingly ignorant of the fiscal ramifications of their policies. This alone suggests grounds for existence of a gap.

However, and regardless of this lack of appreciation, there appears to be

little integration between fiscal information systems and their utilization in forecasting and simulating the fiscal and economic ramifications of a planning policy. For example, as a planner, or a citizen, or a chief executive, it would be very beneficial to be able to estimate the economic impact of the City of Toronto's new anti-growth central area plan. The constraints to developing such a system are complex but their solution would obviously begin with a dialogue between systems people, urban planners, economists, engineers and social scientists. The presentations which focussed upon Montreal, Calgary, Edmonton, St-Jérôme and the National Capital Commission suggest that this integration could be achieved if planners were skilled in the area of information technology, and if information specialists were trained in the area of urban planning.

Finally, let us outline a few basic issues which need to be addressed if we are to effectively integrate planning and information technology. The first point relates to training. A necessary condition for synthesis is the development of skills. This is not to suggest that planners should have the same methodological fix as systems people - they wouldn't be planners anymore! However, planners need to develop a statistical and quantitative competence as well as an appreciation for the value of computer technology. This in fact is beginning to occur in many planning schools. The opposite side of the argument is of course, that information specialists who operate in the area of urban administration study the rationale, theory and political environment of urban planning. This type of training will at least facilitate the articulation of user needs as well as system capabilities.

A second point relates to the environment in which system applications are made to the planning function. Past experience suggests that placing an EDP specialist in a planning office is an extremely valuable as well as efficient means of making the transfer. This "environment" facilitates the informal education of the planner as well as the information specialist, as to the conceptual, methodological, and problem focus of both professions.

Third, it appears that urban planners have been victimized perhaps more than most other urban departments with the menace known as the large scale model. Many planners are very critical of these types of systems. Consequently, in-house interdepartmental efforts at system design and development are much more likely to be successful than the transplant of outside systems.

Finally, we need to establish a dialogue between planners and systems people. This could be done by offering conferences which attract both types of professions.

The nature of the conference would be extremely important. It should at least to some extend emphasize practical applications, as well as display applications which would be of benefit to planners.

In conclusion, it should be stated that within the planning profession things are changing. First there is the growing awareness of the power of information technology to aid in the development and evaluation of urban planning policies. Secondly, the profession is becoming more influenced by what can be characterized as "nonphysical planning", an area which includes activities such as health care, social, criminal justice, and regional planning. For these areas the existing development of information technology provides valuable tools of analysis. Thirdly, contrary to track discussions on the training of planners, the educational system is beginning to respond to these changing orientations of profession.

All of this is not to suggest that planners and information specialists become professionals which are indistinguishable. But rather that both professions should become empathetic towards each other's methodological, conceptual and problem orientations. Both areas have been developing in separate ways. Given the growing complexity of urban governance and the need for fiscal responsibility, the present seems like a good time to form a planning and information technology alliance for urban governance.

## Role of Data Processing as Seen by Data Processing Function

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### Abstract

This paper suggests two alternative perspectives for understanding the behaviour of the local government data processing unit. On the one hand, the unit can be viewed as a provider of services, responsive to the data-handling needs of its user-clients. On the other hand, the data processing unit can be characterized as a skill bureaucracy, which has a relative monopoly on a certain technical expertise and which operates primarily in terms of its own organizational and professional objectives. Analysis of selected data from United States city and county governments provides some evidence that data processing units do reflect the concerns of a skill bureaucracy rather more than a service-provider. Some implications of this finding are discussed.

### Résumé

Ce document propose deux manières possibles de comprendre le rôle des services informatiques dans les administrations locales. Ces services peuvent être considérés comme des fournisseurs répondant aux besoins de "clients-utilisateurs" en matière d'informatique. On peut, d'autre part, les qualifier de bureaucratie spécialisée possédant jusqu'à un certain point le monopole de connaissances techniques et suivant principalement ses propres objectifs professionnels et organisationnels. L'analyse de certaines données obtenues auprès des administrations de villes et de comtés des États-Unis laisse entendre que les services informatiques ont plutôt les préoccupations d'une bureaucratie spécialisée que celles d'un fournisseur de services. Le présent document expose la portée de cette conclusion.

O wad some pow'r the giftie gie us
To see oursels as ithers see us!
It wad frae mony a blunder free us,
And foolish notion:...

Robert Burns

## Introduction

The reasonable notion underlying this symposium is that various actors in local government have different understandings about the roles (that is, the rights and responsibilities) defined for themselves and for others in the organization. This paper attempts to examine, broadly and critically, how EDP (electronic data processing) personnel view their own roles.[1] In particular, the paper suggests that the data processing unit can be characterized as either a service-provider or as a skill bureaucracy and that different inferences about the data processing function can be drawn from these alternative ideal-types.

## Interpreting the EDP Function: Service Provider or Skill Bureaucracy

Increasingly, the formal information system of local governments is centered in the EDP function. From the perspective of the local government as an organization, this function can be understood as a set of service activities involving data: record-keeping, record-searching, printing and calculating, record-restructuring, analysis, and process control.[2] Thus a straightforward interpretation of data processing's view of its own function is that it provides a service to clients (data-users). The quality of the EDP service hinges on the effective utilization of hardware, software, and staff skills to achieve accurate, useful and timely treatment of data provided to them. In this analytic sense, the EDP function is not unlike the typing pool - although EDP is far more technical, both EDP and typing involve the skilful organization of data to facilitate its use by various local government personnel. According to a normative theory of organizational roles, it is the primary responsibility of top managers to decide what EDP should do, of the EDP unit to provide these services, and of the users of EDP services to utilize them effectively.

Alternatively, the EDP unit can be understood in the classic mode of a skill bureaucracy. A bureaucracy with a relative monopoly on expertise will tend to operate in ways that preserve its autonomy from outside control, that assure its dominance in relationships with the clients of its services, and that expand its domain of activity. There is good evidence in American local government, for example,

that the skill bureaucracies in education and welfare achieve this position relative to policymakers and to clients of their services.[3] As a skill bureaucracy, the perspective of EDP personnel would be dominated by internal standards of professionalism, by a continuing drive to expand its range of activities, and by a belief that outsiders are not capable of understanding or directing the EDP function.

**Table 1** Ranking of Importance to Local Government Respondents of EDP Issues in Delphi Survey*

| Issue | Ranking | |
|---|---|---|
| | EDP Personnel | Non-EDP Personnel |
| Extended Applications of EDP | 1 | 5 |
| Accuracy of Data | 2 | 2 |
| System Effectiveness | 3 | 1 |
| User Involvement in Development | 4 | 3 |
| Data Ownership | 5 | 13 |
| System Reliability | 28 | 4 |

*This table is extracted from a list of 40 issues ranked by U.S. local government respondents. The source is John King and Kenneth Kraemer, "Policy Concerns in Municipal Information Systems: Results of a Delphi Survey" (Springfield, VA.: National Technical Information Service, 1975), Appendix F.

A lengthy study would be required to determine the incidence of these two perspectives in local government EDP units. The data from the URBIS research on United States city and county government EDP do provide evidence with which to make some inferences about the EDP perspective.[4] For example, Table 1 offers insights about whether EDP personnel have a unique perspective of their own function. By means of a Delphi study, local government personnel ranked the relative importance (to themselves) of certain aspects of the EDP operation.[5] There is substantial agreement between EDP and non-EDP personnel about the five most important concerns (from a total list of 40). EDP personnel share with users a high level

of concern about data accuracy, system effectiveness and user involvement. But EDP personnel are rather more concerned about extending the range of their activities and about controlling the user's data. The most striking difference is the question of system reliability. For EDP personnel, it seems that an occasional system crash or program failure is inevitable and is not worthy of tremendous concern. For users, however, such disruptions in service appear to have major significance. In fact, they are often a primary cause of user distrust and dissatisfaction with the service they receive from EDP. These distinctions between the major concerns of EDP personnel and others suggest that the EDP pattern of interests is that of a skill bureaucracy rather than a service bureau.

Similarly, the EDP managers' assessments of major "problems" with the EDP function are revealing (Table 2). Of the top 12 problems, 8 involve either the incapacities of the users (e.g., inadequate understanding, unrealistic expectations, supplying inaccurate data) or the limitations imposed by top management on the goal of more and better EDP staff (e.g., too few analysts, inadequate salaries). The other top problems relate to documentation, which can be interpreted as an issue of internal professional standards. The failures which are attributable to EDP itself, in its role as a service provider (e.g., unreliable performance, late delivery, programs not meeting user specifications), are, according to the EDP managers, among the least problematic aspects of the data processing function. While the managers' ordering of problems might be accurate, interviews with many users suggest that users are much more concerned with problems of EDP service provision. Hence, the EDP manager's views seem to be those of a skill bureaucrat.

Table 3 examines the activity mix of the programmer and analyst staff. There is substantial variation in the allocation of staff resources across local government installations. But it does seem that most installations spend rather more time on new application programs (both analysis/design and program/debugging) and rather less time on reconceptualizing, documenting, or maintaining existing programs. (Given this allocation of staff, recall that the EDP manager's third, fourth and fifth ranked problems were old program conversion and documentation.) It is also revealing that the two areas with greatest felt need for more attention are analysis/design, the basic thrust of expansion, and documentation, a possible flaw in internal professionalism.

**Table 2** Local Government Data Processing Managers' Perception of EDP-Related Problems

| Rank | Problem | Value* |
|---|---|---|
| 1 | Users not knowledgeable about EDP | 1.54 |
| 2 | Users underestimate time for development | 1.48 |
| 3 | Large number of old programs to convert | 1.30 |
| 4 | Inadequate documentation for users | 1.15 |
| 5 | Inadequate documentation for operating staff | 1.14 |
| 6 | Too few analysts | 1.12 |
| 7 | Inaccuracy of data supplied to EDP | 1.09 |
| 8 | Users expectations unrealistically high | 1.08 |
| 9 | Too few applications programmers | 1.08 |
| 10 | Inadequate documentation for maintenance | 1.07 |
| 11 | Difficulty recruiting good EDP staff | .96 |
| 12 | EDP salaries not competitive with industry | .90 |
| 13 | Application development time exceeds delivery dates | .89 |
| 14 | EDP lacks acceptance of department heads | .80 |
| 15 | EDP lacks acceptance of user department staff | .76 |
| 16 | EDP lacks acceptance of local officials | .76 |
| 17 | Frequent minor software problems | .75 |
| 18 | Programs do not meet user specifications | .72 |
| 19 | Operating schedules delayed beyond deadlines | .72 |
| 20 | High costs modifying programs to meet requirements | .66 |
| 21 | Cuts in EDP design and development budget | .51 |
| 22 | Unreliable performance of computer hardware | .47 |
| 23 | EDP cost too high for local officials | .43 |
| 24 | High cost of training EDP staffs | .43 |
| 25 | Cuts in EDP operations budget | .40 |
| 26 | Unreliable performance of operating system | .39 |
| 27 | High costs to train users to use EDP applications | .36 |

*Average score based on these category values (N=495):
Not a problem during last two years = 0  A problem during last two years, now resolved = 1  Currently a problem = 2

**Table 3** Allocation of Programmer and Analyst Staff Time in Local Government EDP Installations*

| Activities | Percent of over-all programming and system analyst time** | | | | | | | Area in greatest need of more activity (%) |
|---|---|---|---|---|---|---|---|---|
| | Mean*** | <10 | 10-19 | 20-29 | 30-39 | 40-49 | 49 | |
| Analysis and design of new programs | 22 | 24 | 14 | 37 | 14 | 9 | 1 | 45 |
| Programming and debugging of new applications programs | 25 | 20 | 8 | 33 | 21 | 8 | 10 | 10 |
| Reconceptualizing designs of old applications | 11 | 44 | 36 | 14 | 2 | 1 | 3 | 14 |
| Maintaining applications programs | 19 | 20 | 34 | 22 | 11 | 6 | 7 | 1 |
| Maintaining operating system software | 9 | 76 | 18 | 5 | 2 | 1 | 0 | 1 |
| Documentation | 8 | 43 | 48 | 8 | 1 | 0 | 0 | 26 |

*Respondents are 452 U.S. city and county local government data processing installations.

**Column percentages are the proportion of total installations within that response category.

***Column adds to less than 100% because there was an "other" category.

The propensity of EDP to operate as a skill bureaucracy is increased by the failure of many managers and users to fulfill their roles vis-à-vis EDP. Local government chief executives generally do not exercise control over many of the most critical decisions about the development and use of EDP. According to data from chief executives and EDP managers, chief executives focus their attention upon hardware decisions; but most exercise little control over the fundamentally important decisions about priorities of applications development and implementation.[6] Moreover, users tend to lack sufficient grasp of the capabilities and limitations of the technology. Consequently, the users are often incapable of effective guidance of application development and tend to underutilize existing applications. The initiation, often at the prompting of EDP, of such arrangements as EDP Policy Boards and user involvement in design can be seen as attempts to induce managers and users to fulfill their roles. But such arrangements can also be interpreted as means to coopt others into structures for EDP advocacy. User involvement, for example, is a useful method to condition client groups to make demands for an expanding array of services from EDP.

There is some ambiguity in drawing implications from this view of the EDP role, because the skill bureaucracy serves its own interests best by serving its clients adequately, if not well. And it might be that only EDP personnel do have sufficient understanding of the technology to make reasonable decisions about what to do and how to do it. But the fundamental problem is that the perspective of a skill bureaucracy is primarily to maximize its own benefits and only secondarily to benefit the clients served or the total organization. The organization theory notions of "suboptimization of goals" and "goal displacement" capture aspects of these phenomena.

## Conclusion

The dominance in the EDP unit of the values of autonomy, expansion, subordination of clients, and internal professionalism would make certain common occurrences in local government EDP more understandable: automated applications which are technically refined but do not especially facilitate the user's functional activity; the dependence of top policymakers upon EDP for critical information with which to determine EDP development priorities; hardware with excessive capacity and sophistication relative to the EDP services provided; the continuing stream of decisions

to automate new applications for which there are few well-defined benefits. In sum, this paper suggests that EDP, in viewing itself as a skill bureaucracy rather than as a staff with a skill, has a perspective of its own function that might not be particularly beneficial and responsibe to the needs of the government organization it serves.

## Notes

1 Brevity forces simplicity. A major simplification in the paper is to treat "EDP personnel" as though they have a relatively monolithic perspective. While there are certainly differences in perspective both between categories (e.g., EDP manager, analysts, data entry staff) and between individuals, it is likely that those in EDP do share broad understandings about their role.

2 Elaboration of these "information processing tasks" is found in James N. Danziger, "Computers, Local Government, and the Litany to EDP," Public Administration Review (forthcoming, and currently available as a Working Paper in Policy Research, Irvine, CA: Public Policy Research Organization).

3 Representative of the many studies supporting these notions are: Theodore J. Lowi, "Machine Politics - Old and New," The Public Interest (Fall 1967), 83-92; Wallace Sayre and Herbert Kaufman, Governing New York City (New York: Russell Sage, 1960), 771ff.; David Rogers, 110 Livingston Street (New York: Random House, 1968); Paul Jacobs, Prelude to Riot (New York: Vintage Books, 1967) 61-96.

4 Most data in this paper are taken from various phases of the URBIS research project. Part of the evidence was derived from intensive field studies. Other data are based on self-administered mail questionnaires sent to the chief executive, data processing head, and each data processing installation in each United States general purpose local government (all municipalities with a population greater than 50,000 and all counties with a population greater than 100,000).

5 The study and data are in John King and Kenneth Kraemer, "Policy Concerns in Municipal Information Systems: Results of a Delphi Experiment." (Springfield, VA: National Technical Information Service PB245696, 1975), Appendix F.

6 See Kenneth L. Kraemer, "Who Really is in Charge of Decisions about EDP?" Nation's Cities 13 (No. 10) (October 1975), 37-40.

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Calgary, Alberta

## Abstract

The City of Calgary introduced data processing equipment over 22 years ago. Since that time it has continued to develop and expand its information systems function, to where it is now widely regarded as one of the leaders in the application of information technology in urban governance.

This paper traces the history of that development process, describes the present day organization of its development resources, and outlines some of the important requisites for an effective systems development effort. The paper concludes with a review of some important corporate considerations.

## Résumé

L'utilisation d'équipement informatique par la ville de Calgary remonte à plus de 22 ans. Depuis lors, la ville a assuré le développement et la croissance de son service d'informatique, si bien qu'on le considère aujourd'hui comme l'un des chefs de file dans l'application de l'informatique à l'administration urbaine.

Le présent document trace l'histoire de ce processus d'élaboration, décrit l'organisation actuelle des ressources du service dans le domaine du développement et présente brièvement quelques conditions importantes requises pour élaborer des systèmes efficaces. Il se termine par l'examen de quelques questions importantes touchant la ville de Calgary.

## Introduction

How many of you here today are able to quantify the quality of direction and control that you either provide or receive in the information handling functions of your organization? How many of you can conclusively contrast the dollars you're spending with the returned value in information delivery and quality? How do you know whether a one-quarter million dollar project for the Police Department is more important to the corporation than a fifty thousand dollar project for the Long Range Transportation group? Do you ask the information systems development personnel to coordinate their activities with the long term policies and direction of the overall corporation?

If you are asking these questions and feel that you are getting reasonably reliable answers, then your organization probably has some 'management systems' in place. Hopefully this paper will provide some 'food for thought' about management systems (where and how they differ from existing application systems) and how a corporation might organize to attach increased emphasis in this area.*

At this point it would be useful to define what is meant by a management system. By definition, management is the major task and responsibility of managers, and a 'management system' aims directly at improving the effectiveness of the management process. It can be seen that a system which supports such corporate management functions as policy research, formulation, and application, for example, long range revenue and expenditure forecasting, community program planning, budgeting, implementation, and evaluation, bears little resemblance to the typical operational or application systems we are familiar with today.

However the need to give at least 'equal time' to the development of both <u>application</u> and <u>management</u> systems is becoming much more evident. This realization becomes even clearer when we consider that the overall costs of providing community services in the City of Calgary exceeds one million dollars per day at the present annual rate.

When the systems development program is put in this perspective it becomes much easier to decide on priorities between a new payroll or billing system, and

* Editor's Note: This paper, as can be readily seen, offers a management systems perspective on the role of the data processing function. The title of the paper was modified by the Editor for the purpose of maintaining consistency among the titles of all papers. Clearly, however, the nature of the message is not altered.

a PPB system (Planning, Programming, Budgeting System) for example.

The rest of this paper endeavours to outline general areas of concern facing most corporations, with respect to the information systems function; and then report on past and present approaches by the City of Calgary in its systems development effort; with a brief summary of the more important lessons learned over the years relative to this increasingly important corporate function.

## Areas of Concern

Some three or four years ago one of the major United States computer societies surveyed a number of companies to find out the major problem areas facing data processing. After numerous meetings and discussions their conclusion was - "the growing credibility gap between general management and data processing management, coupled to the lack of effective direction and control of data processing by general management." Now that conclusion describes or embodies quite a host of problem areas. One could write a book (and there are probably hundreds already written) on the subject of "effective direction and control" by top corporate management.

It is my contention that the lack of effective direction and control of data processing by top management is a direct result of the absence of a sufficient level of understanding by top management of the information systems function. Thus it has been virtually impossible to achieve the vital agreement necessary between the systems and data processing professionals, and corporate management, on the most basic of issues such as:

1 What constitutes effective direction and control for the systems development function?
2 How to evaluate the return for monies expended on the systems and data processing function?
3 How to achieve the best allocation of scarce human resources?
4 How to coordinate the proper short and long range system development program to provide perspective for corporate, organizational, and departmental points of view?
5 What is the nature and substance of information, necessary for effective decision making?

These questions, by and large continue to go unanswered, and in many cases are not even being addressed. Is it any wonder that the gap between corporate expectations from the systems development effort, and what is actually delivered to the corporation, continues to widen?

Some of the problem lies in the fact that senior executives tend to come from financial or operating backgrounds and have little awareness of information technology. However, I believe that most of the 'blame' (if blame has to be placed) probably lies with the systems and data processing professionals within the organization. I feel it is their responsibility to 'inform' top management of the importance of viewing INFORMATION as one of the most valuable resources, if not the most valuable resource, available to the corporation.

Now I realize that many of the systems and data processing managers here today will exclaim - "How can I inform top management? The only time they want to discuss my operation is at the annual budget review session, and by then 75% of my resources have already been committed.". All I can say, is, that you must! The information systems function must be elevated to the highest level of the corporation. Its management must be considered part of overall top corporate management. It must be involved in policy formulation and long range planning strategy development. When, and only when, this approach is adopted will corporate understanding of the five questions already outlined as well as their answers, start to be possible.

Later in this paper I will describe steps taken by the City of Calgary to deal with this realization as outlined above.

## Data Processing During the Fifties and Sixties

The City of Calgary has utilized data processing equipment of one form or another for over 20 years. During the spring of 1954, punched-card tabulating equipment was installed to "automate" the customer billing system for the city owned power utility. From those early primitive steps in data processing, the City's capability has grown over the years to include over 100 employees directly involved in the systems development and computer function, and utilizing an IBM system 370 computer, handling both batch and on-line terminal operations.

In the early years it was relatively simple to plan and introduce new data processing applications. The needs of 'client' departments were straightforward and essentially involved automating existing processes or procedures. The cost benefit analyses were readily performed and the unit processing costs easily determined. After all, one was evaluating very few variables - i.e. the number of cards per minute through the machine, the number of lines per minute printed, and the number of documents or pages of a report. The emphasis was usually on application efficiency rather than on 'information delivery'.

But times have changed! The development of the electronic computer, sophisticated operating systems, mass storage, virtual memory, remote terminals of every possible size and description, as well as providing us with endless opportunities, has also presented untold complications. The new 'space age' computer hardware and software, the evolution and development of systems technology, primarily through military and space programs, have now made available to even the smallest urban governments, resources and techniques which a few years ago would have only been available to the world's largest companies.

As usual, however, we find that the sophistication of machines and techniques, far outstrips the capability of persons or groups which use them. McLuhan states in his book 'The Medium is the Message' -

> our 'age of anxiety' is, in great part the result of trying to do today's job with yesterday's tools --- with yesterday's concepts

To paraphrase McLuhan,

> our information anxiety is, in great part, the result of trying to anticipate and satisfy tomorrow's needs, for today's executives, with yesterday's tools, using last week's technology, (for our corporations do not always keep up to date in technology)

The City of Calgary's administration, in its consideration of this 'anxiety', felt that the best approach would be through organizational and procedural changes within the information systems development function.

## The Approach for the Seventies - And Beyond

During the mid to late sixties it became evident that the 'tools of the trade' (i.e. the computer system itself with its virtually unlimited capacity and capability,

sophisticated operating systems that could allow many applications to operate simultaneously, etc., etc.) were in most cases waiting for the human resources to 'catch up' in their knowledge and understanding of the potential of these new hardware/software systems.

The City of Calgary has been more than casually aware of the need and desirability to keep its staff up to date with the current technology. As pioneers in the development of urban data systems (the City of Calgary was one of the first customers utilizing a 'third generation' computer, installing an IBM system 360 in 1965), staff development costs have been an on-going consideration for more than two decades.

However, as the seventies approached it became clear with the advent of 'fourth generation' computers, ultra-sophisticated and complex data base management software, (i.e. IMS, TOTAL, SYSTEM 2000, ADABAS, etc.) advanced analytical and management science techniques, along with the purported benefits accruing to those companies who were far enough advanced to utilize them, that we were indeed into the 'age of specialization' or 'functionalization' as it were. At the same time as these technological complications were developing, corporations were also starting to experience organizational unrest with respect to their computer applications, and there was a growing demand by departments for a more direct involvement in the development of their systems. With this possibility in mind and a growing demand by all sectors of the City's organization for more and more computer and analytical support in their day-to-day operations, the City of Calgary's administration decided to reorganize its information systems resources so that these situations might be dealt with effectively.

**Management Systems - Data Processing Services**

Early in 1972 Calgary's City Commissioners created two new departments - the Management Systems Development Department and the Data Processing Services Department, having overall responsibilities for the systems analysis and operations research functions; and the computer, application programming and data entry functions respectively. This organizational change has allowed each department to concentrate all its efforts into the specific technical areas for which it is responsible (Figure 1). Initial effort by both departments involved reviewing existing procedures

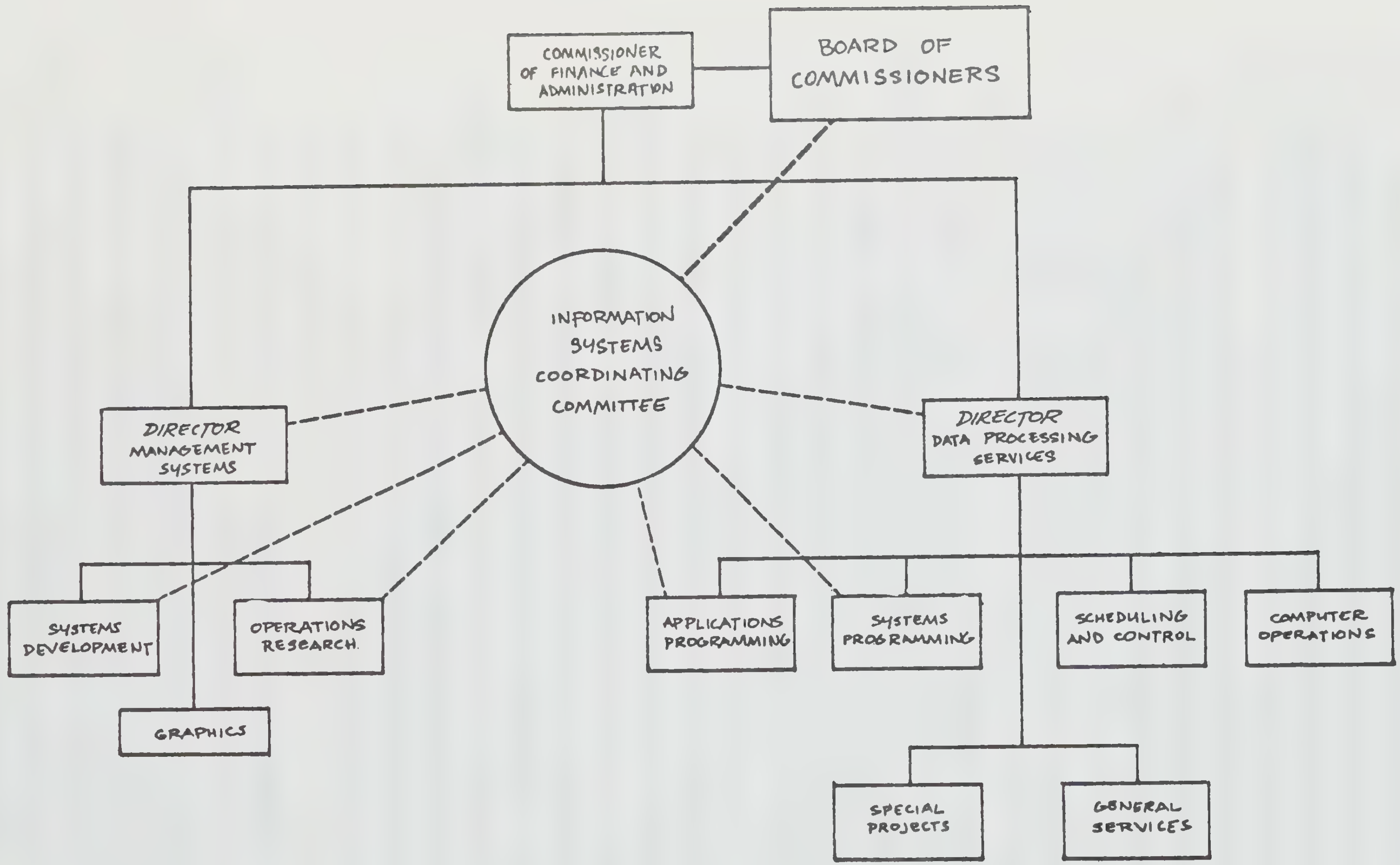


**Figure 1** Organizational Structure for Information Systems Development

and techniques, resource requirements, and confirmation of a joint strategy for Calgary's future information systems development. We, at the City of Calgary, feel that this organizational approach is providing the means to deal effectively with the five major concerns outlined earlier in this paper, and in general ensure the successful development of an effective information management system. Although space does not permit an exhaustive description of the differences between the City's approach and traditional organizational approaches, I will try to provide some understanding of the main differences as they were introduced.

**Systems Analysis and Operations Research**

Most professionals in the Information Systems function agree that the 'expectation gap' between information systems potential and its realization by the corporation in general, is significantly greater than both management and analysts desire. We, at the City, certainly agree with this position, and one of the main responsibilities of the Management Systems Development Department, in an effort to narrow this gap, was to introduce an increased emphasis on the analysis and research stages of project development.

To directly address this lack of continuity between operational systems and the needs of management and decision makers, the Management Systems Development Department has defined two general functions within the department - computer systems analysis and operations research. Basic to this type of organization is the understanding that systems analysis and operations research are basically one and the same. An operations research analyst brings highly specialized skill sets to bear at the management planning and policy levels of the organization in order to achieve problem solutions, while computer systems specialists working hand in hand on project teams with operations research personnel translate the proposed solutions into computer systems design.

In addition, the development of applications to support City operations must parallel and be consistent with development of strategic planning and management control systems. The integration and linking of operating level applications to form a base of corporate data are fundamental to addressing and satisfying the information needs of these managerial decision and policy making aspects of the City's operations. The result of this integration will improve both accessibility

and quality of the information input to the management process. It is also essential that the management process be analyzed with the view of improving the information processing capability of the decision maker. The relationship between operational control and management planning is illustrated in Figure 2. While it is implicit that both of these areas operate from common bases of data, it does not imply that data in both instances be of the same form or of the same time frame.

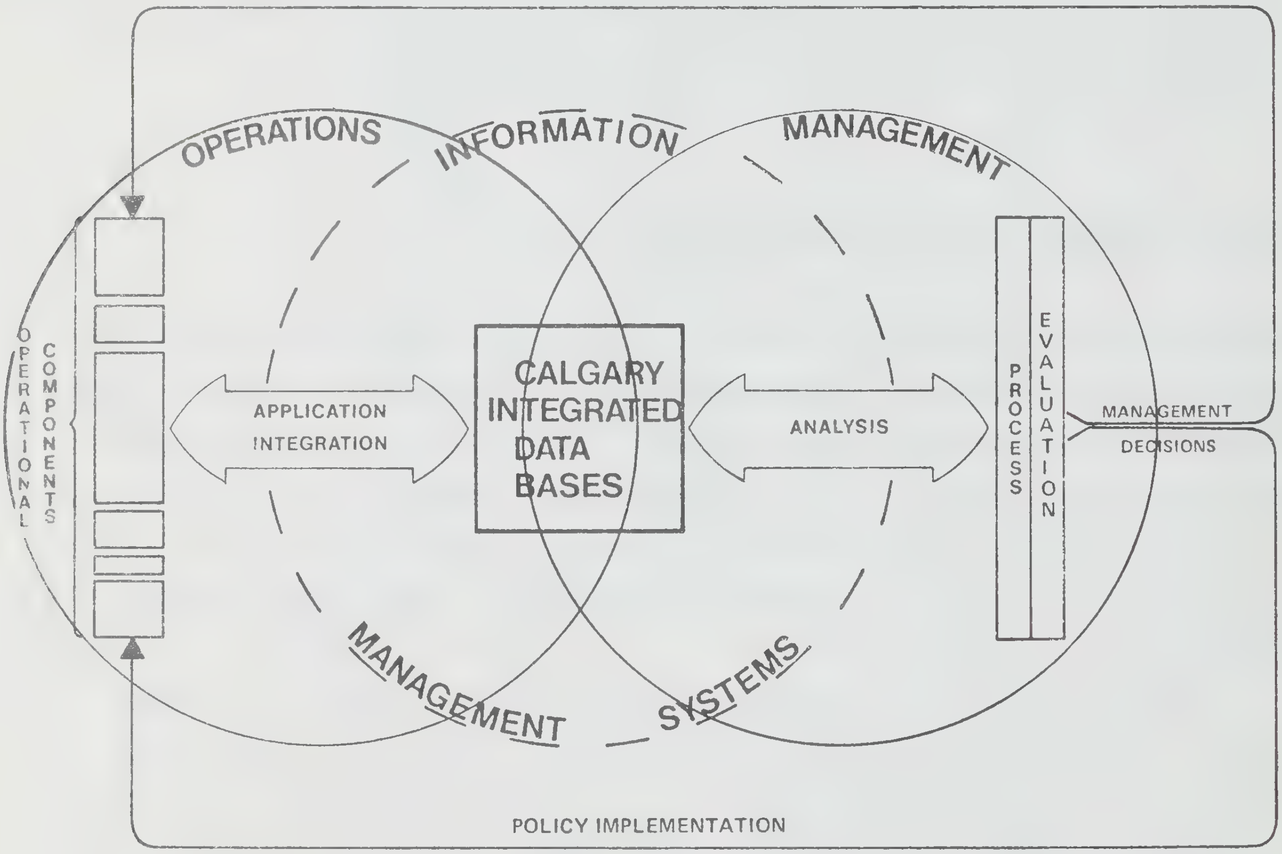


**Figure 2** Operations/Management Interface

## Formalizing the Development Process

Supporting this approach to the analytical function was the introduction of a formal Systems Development Process Cycle (Figure 3). Any City department may perceive a situation in their operations which could be a potential for systems work, and upon receipt of a written request by the Management Systems Development Department it will be considered for inclusion into their systems development work program. When a problem has been given the green light for a Preliminary Study both the analyst and the client department representatives are required to operate within the framework of this process. As can be seen in the illustration, the process

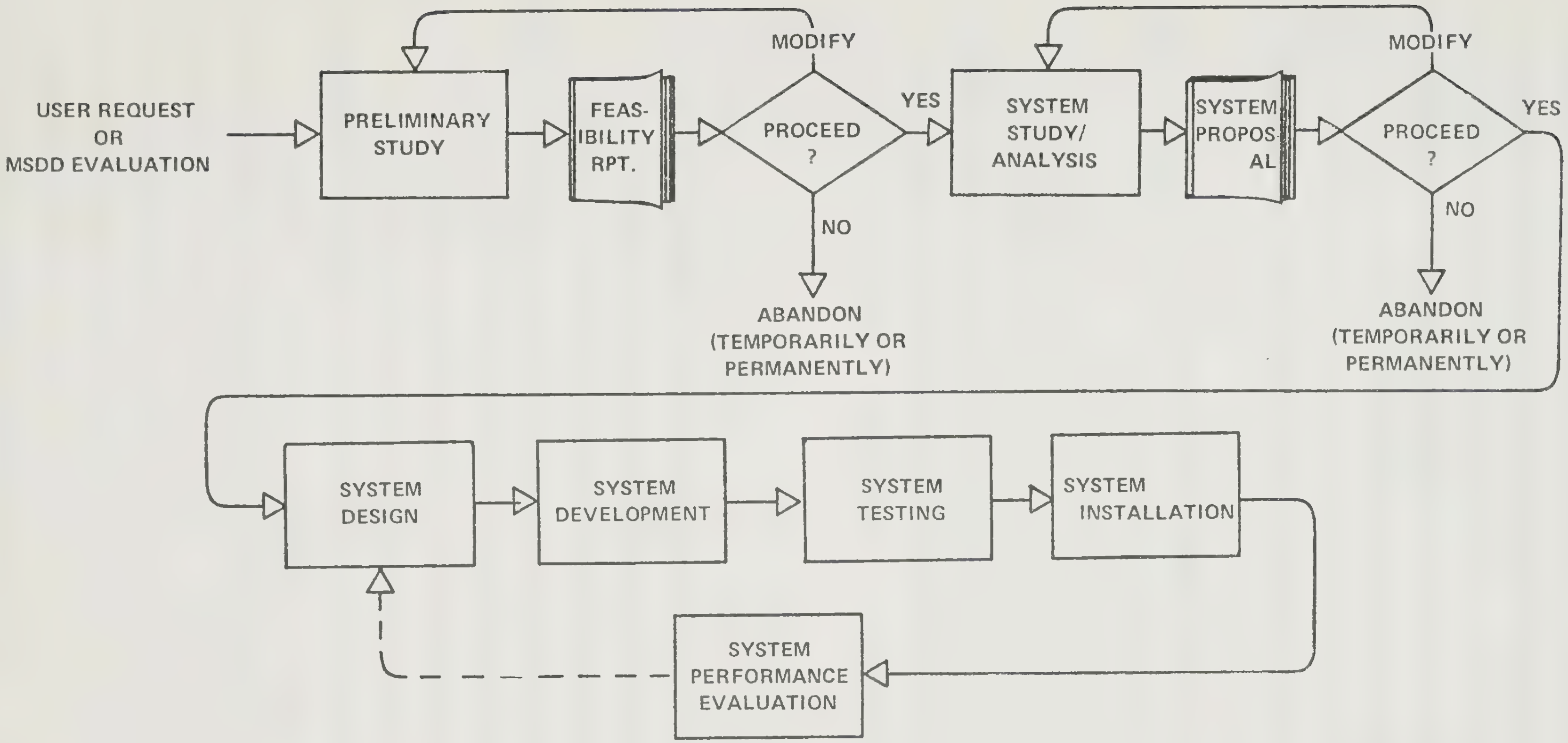


**Figure 3** Stages of Systems Development

has been divided into seven general stages. These stages have been further defined into over one hundred specific work tasks, which provides the 'road map' for the overall development effort.

Without going into further detail on this development process I would nevertheless like to mention the more obvious benefits from this effort:

1 Tasks are pre-identified.
2 A better picture of the magnitude of effort is provided to the client at the outset of project discussions.
3 Milestones provide check points for management review and control.
4 Resource planning can take place earlier in the process.
5 Management reports emanating from the first two stages of the process go a long way in achieving that 'elusive goal' - common understanding of recommendations and problems. They also provide early vital decision points for approving effort long before traditional 'point-of-no-return' is reached.

## The Team Approach

In recognition of the need for communication and involvement in today's systems development, the City's effort relies heavily on the project team concept. The Project Team is composed of members from client areas, Management Systems, and Data Processing. The client or user department must appoint a senior departmental representative as the Project Team Leader and commit the appropriate subject matter personnel as needed. The responsibility of the systems specialist is to guide and coordinate the analysis and design effort. The Data Processing member of the Project Team is primarily responsible for insuring that the concepts embodied in the approach taken, are compatible with technological capability. Further, he is responsible for development and implementation of computer support.

## Project Priority Review

The primary purpose of the Information Systems Coordinating Committee (Figure 1) formed during 1974, was to coordinate systems development effort. Six senior staff members, including the Directors of the Management Systems Development

and Data Processing Services Departments, meet on a regular basis to review the status of the various projects. This review involves evaluating the ultimate benefit of projects to the City, and insuring that concepts and design are consistent with the overall approach for the City's Information System. A priority rating system has been developed and is useful in attaching a development priority to each project. This has provided an objective means for establishing project priorities at the end of the Preliminary Study and Proposal stages.

**Walk-Through**

The 'Walk-Through' is a relatively simple but highly effective method of insuring the highest possible quality in the analysis and design stages. The Management Systems Development Department instituted this technique as a means of quality control. Each systems analyst is required to formally present his findings and design approach to other members of the department. This has resulted in a number of benefits:

1 High quality methods and techniques are applied to each project.
2 Departmental expertise has developed rapidly.
3 Presentation techniques and oral delivery styles are evaluated and refined before the proposals are presented to client department management.

This critique has resulted in high quality presentations, and in most cases clear understanding by the client departments of the recommendations made by the project teams.

**Project Control**

Because of the complexity of projects, in the systems development and operations research fields, an effective means of allocating and controlling project resources is vital. Consequently a study of project control techniques and a review of available project control systems was undertaken. A 'package' system has been selected and is being implemented. The system will be used to monitor and control all systems development projects with status reports being supplied to project leaders and all levels of organizational management whose resources are involved, and who have a stake in any particular project.

## Conclusion

Although some departmental responsibilities, not clearly defined when the 1972 reorganization took place, seem to have been resolved, the benefits accruing from the introduction of the approaches just previously described, along with a profound acceleration in corporate understanding of both the value, and the problems involved, in Information Systems Development, has confirmed that the City's approach for future systems effort was indeed valid.

In summary, some of the lessons we have learned are:

1 People do not learn by osmosis. We, the information systems professionals, have a responsibility to our executives to improve and update their awareness.

2 Prioritizing projects and managing resources from a corporate view (not a parochial one) is vital.

3 Investment in research is important. The benefits are not always immediate but ultimately it pays off.

4 There are no prizes for not keeping up with technology. Ultimately, you pay heavily for using outdated methods, approaches, concepts, and technology, and not hiring top quality personnel.

5 Senior executives must place the proper corporate scope and importance on information processing. This means COORDINATION in all possible ways.

6 Sometimes the growing pains of new organizational structures are quite worthwhile in the long run.

# Role of Data Processing as Seen by Planning Function

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## Abstract

Information technology has been used effectively in some municipalities. Data processing and the planning function have helped each other become more effective corporate resources. In other municipalities, this has not happened due to the failure of one or more of several needed conditions. Some of these conditions will improve in the future but others will deteriorate.

## Résumé

L'informatique a été utilisée avec efficacité dans quelques municipalités. Services informatiques et services de planification ont contribué mutuellement à accroître leur efficacité en tant que ressources au service d'un corps constitué. Dans d'autres municipalités, cependant, cela n'a pas été le cas, à cause du défaut d'une ou de plusieurs conditions nécessaires. Quelques-unes de ces conditions s'amélioreront dans l'avenir, mais d'autres ne pourront que se détériorer.

## Introduction

First to be considered are some of the contributions that data processing has made towards the evolution of urban governance as perceived by the planning function:

Data processing has contributed to the interdisciplinary staffing of the other functions. Data processing, with the increased discipline it required and the increased sophistication it allowed in data gathering, storage, retrieval and analysis, represented a big wedge in the door of the traditional planning function. Planning staff was complemented with economists, mathematical statisticians and data processing specialists to turn data into information. This was followed by further interdisciplinary staffing including environmentalists, public relations specialists, sociologists and other types of specialists. This has contributed in no small way to the application of more sophisticated information techniques in urban governance.

Data processing and information systems technology, in particular, have enabled the same set of data that is used in day-to-day operations (such as assessment, police, building permits, public works, etc.) to be used in the other functions. Instead of operations using one set of data to administer the day-to-day line function of the corporation, and the planner gathering an independent set of data for use in the intermediate and long range planning, both now use a common set of data. Previously the operations data were simply too much to analyse. Many different and contradictory conclusions in local government were caused from the lack of uniform data.

Data processing has simplified the analysis stage of information. The planner no longer has to be preoccupied with the traditional and time consuming task of turning data into information andcan give more time to corporate policy issues. While in the past production of population projections, land use data, assessment data and the like was tremendously time consuming, and difficult to analyse using differing assumptions, data processing has made this task routine and timely. Analysis no longer has to be "cast in cement" because of the speed with which alternative assumptions can be analysed and the impact of the change isolated.

Data processing has made possible the use of mathematical and simulation models in both the planning and management environment. This evolution in information technology has produced the ability for timely answers to "what if" questions.

Testing for the major benefits, costs, or anomalies of a proposed policy initiative prior to its introduction in the real world, has been an important advance for urban governance from a planning function perspective.

The above points are not all inclusive, but do serve to illustrate the more significant, albeit sometimes subtle ways that data processing has, or should have, contributed to the evolution of information technology and urban governance at the local level.

### Planning Function Impact on Data Processing

In these same municipalities where data processing has had these effects, the planning function has had a sizeable impact on the direction and speed of change that has occurred in the data processing and information technology field.

Firstly, it was the sustained pressure from the planning function at the local level that turned data processing into a truly corporate resource. The demands and directions from the planning function changed the perception of data processing from a purely accounting machine into a more sophisticated planning and management tool. It was the planning function that directed a major part of the effort in information systems development at the local level.

Secondly, it was the planning function that got rid of the in-house programming syndrome with the introduction and use of canned programs and general purpose software. The in-house programming requirement at the local level may entirely disappear in the near future.

### Some Comments on Successes and Failures in Implementing Data Processing

An ideal interaction between data processing and the other functions has not happened in all municipalities. In some, where data processing systems have been poorly implemented, new information technology may have made the processing of data slower, more costly and less reliable. If something goes wrong the answer is, "The computer made a mistake." As a result all new information technology is now suspect in these organizations. The problem becomes worse. For such organizations

the problems solvable by information technology and data processing are not attacked from this direction.

Why has this happened in some places and not others? The answer is a function of:

1 Knowledge of non-data processing staff concerning the capacities of the technology
2 Management abilities
3 Resources available
4 Political climate
5 Systems in use
6 Availability of data

The impact of the individual elements on the success or failure of information technology will differ greatly from municipality to municipality.

A second more practical question is, "What can be done to improve information technology in municipalities where it failed in the past?"

It is not as difficult technically at the present time to introduce improvement in information technology into a municipality. Systems that have been tried and tested in many levels of government are now available for use in similar jurisdictions. The cost and risk of using tried and tested systems is much less than developing similar systems from scratch. However, a local government unit that previously had little success in the use of new information technology and historically has not been successful enough in the use of data processing techniques, will have a number of important restraints to overcome. These include factors such as:

1 The organization has become prejudiced against new information technology and does not want to learn how to use it.
2 The present budgetary restraints do not allow locally innovative programs to start.
3 The present slow growth does not force inefficient or inadequate systems to collapse under their own weight, as the fast growth of the late sixties and early seventies did.

## Conclusion

This paper has not advanced ideas on how the data processing can play a more important role in the evolution of information technology in urban government. It is obvious,

however, that the more focused the effort on information technology from all functions, and the more interdisciplinary the work, the more adequate will be the role and response of data processing in the evolution of information technology at the local level.

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## Abstract

This paper outlines a proposed management (information) system for the Province of New Brunswick. The system, in general terms, will be comprised of six cities serving as focal points for computer terminals, with perhaps one main computer being located in Fredericton, the provincial capital.

## Résumé

Ce document trace les grandes lignes d'un projet de système intégré de gestion conçu pour la province du Nouveau-Brunswick. En termes généraux, le système sera composé de terminaux placés dans six villes-clés, qui seront peut-être reliés à un ordinateur principal situé à Fredericton, la capitale provinciale.

## Introduction

I do not come to you as an expert in data processing. I am a manager. We have a project under way in New Brunswick which we hope will satisfy our information requirements for an indefinite period. I feel that it might be of some value to you to explain the project while we are still in the planning stage of it, and to tell you of the relationships that have existed between management and the data processing people during the period that this project has been under way.

New Brunswick is a province of approximately 650,000 people. About 420,000 live in incorporated municipalities. We have 6 cities, 20 towns and 85 villages. The cities range in population from about 12,000 to 100,000; the towns from 1,000 to 16,000; and the villages from 200 to 4,500. We are planning to implement data processing in New Brunswick in such a way that all the cities and towns and any of our villages wishing to take advantage of the system will have access to the data processing system. I hope that my presentation will be useful as it probably will zero in on municipalities of considerably reduced size to ones that one normally thinks of as having data processing capabilities. We feel that the system we are moving towards will work in spite of the relatively small population in our municipalities.

## Origins of the Data Processing System

The initiative in promoting the data processing system in New Brunswick came from the Six Cities Administrative Officers Association in November 1973, and was supported wholeheartedly by the Six Cities Association at that time.

On November 27, 1973, the Minister of Municipal Affairs appointed a Management Information Services Committee. I was named as Chairman of the Committee and there was representation on it from each of the six cities, one town, one village and the Director of Data Processing in New Brunswick.

A preliminary survey was conducted in the six cities, five of the towns and two villages with a view to identifying current problems in obtaining information and the areas in which information processing would be of assistance.

In the course of carrying out their activities, the preliminary survey team found all municipalities and other individuals interviewed during the study extremely cooperative and genuinely interested in identifying the best solution for their information

processing. All municipalities expressed an interest in cooperating with other municipalities to improve the information processing.

## Data Processing System Environment

The preliminary survey found that all municipalities have need for better, more up-to-date information, and that municipalities are finding it increasingly difficult to meet their information requirements on their own. The two major reasons indicated were costs and lack of information processing expertise. The survey team also found that the municipalities are most interested in cooperating and participating with the provincial government in any project which is likely to meet at least some of the information needs identified.

In addition to the absolute requirement for data processing capability in the housekeeping functions, the municipalities are aware of the lack of information available for planning purposes and they requested that the study team report needs in such areas as:

Land Use
Census Information
Inventory of; and
Location of Services.

The information requirements of our municipalities can be categorized into three major groups: administrative information requirements such as payroll and utility billings; planning information in such areas as land use and census information; and other requirements such as information concerning available grants and loans from senior governments and access to municipal information maintained by the provincial government, Statistics Canada and other government jurisdictions.

The survey team concluded that most municipalities are not large enough to economically justify their own information processing expertise and facilities and that a detailed study is necessary to determine a cost effective method to satisfy the information processing needs of the provinces' municipalities.

In the opinion of the study team, benefits can be realized by the collective participation of the municipalities in the development of an information processing system. The team recommended that a detailed feasibility study be conducted. Its purpose would be to 1) to develop concepts to provide for, and process information

to meet the municipal needs, and 2) develop alternatives approved by the Management Information Services Committee into a design and implementation plan indicating costs and time estimates. This Systems and Design Study will consider availability of resources.

The Committee anticipates that when the study is undertaken it will conclude that the Data Processing System should probably concentrate on the cities with high capacity terminals. These cities would then service the data handling needs of the smaller towns and villages in their particular regions. It is quite conceivable that a central computer will be utilized in one location, perhaps Fredericton, and some thoughts are being given to the possibility of the provincial government utility in Fredericton serving as the central computer for the system. This of course has not been finalized as yet and awaits the results of the forthcoming feasibility study. It is merely a visionary's view of an exciting possibility.

As we in the Management Information Services see it, our initial objective in the system will be to provide data processing capabilities for all of our municipalities for their routine domestic accounting requirements such as accounts payable, accounts receivable, user-charges for utilities, etc.

Once this has been accomplished, we see a second phase in the program concentrating on data of the various municipalities and provincial and federal government departments such as Statistics Canada being available for use by any of the interested parties.

It is not our intention to overlap with any facilities available through other courses such as the Land Registration Information System. We have received advisory assistance from the Ministry of State for Urban Affairs and Statistics Canada, and we foresee calling upon these two agencies in the future as necessary.

## Conclusion

We feel that the problem that we have of obtaining the necessary funds for the Systems and Design Study will soon be resolved, and that we will soon be in a position to get this study started. After that we will be ready to roll and the system should be able to be put into place. Perhaps we will be able to start with the City of Saint John, and then add the other cities to the system at the appropriate time. If this project does come to fruition we feel that we will indeed have a comprehensive data processing system in New Brunswick.

## Role of Data Processing as Seen by Operations Function

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### Abstract

The discussion deals with a subject somewhat different from that presented in most of the Fourth Track Session. Here we are concerned with Information Systems provided to satisfy the user who would analyse urban (or other socioeconomic) systems via impact studies and policy analysis and needs a computer to do this.

### Résumé

La discussion porte sur un sujet quelque peu différent de celui dont il a été question pendant la majeure partie du quatrième atelier thématique. On s'intéresse ici à des systèmes informatiques conçus pour satisfaire un utilisateur qui analyserait des systèmes urbains (ou d'autres systèmes socio-économiques) par des études d'incidence et des analyses de politiques, et qui aurait besoin d'un ordinateur à cette fin.

## Introduction

Reflecting on the goals of the present set of discussions brings to mind two fears. First, there is nothing new to be said about computer user/provider roles since they have been coexisting for about 40 years. One hopes a harmony between user and provider has developed to make "living easy." Second, policy formulation for urban government is an important application of information systems technology but is more aligned with art than science. So, some cold water must be sprinkled on the zealous anticipations of those who would develop information technology for enlightened urban governance. It perhaps just can't be done.

## Some Peculiar Problems of Urban Systems Computer Usage

To examine the fears expressed above and try to resolve them, urban usage (to keep within the terminology of this Symposium, the "user" here is equivalent to the "operations unit") of computer technology should be placed into the perspective of all computer technology.

In the formative years, any computer for any use was a touch and go proposition. If you wanted to use a computer you took your chances with no regrets. Urban problems were not being considered.

Now, computers are as reliable and as powerful as a realistic user can ask. In the past, we were ignorantly and independently happy pioneering the use of computers. Today, the urban analyst must include himself on the list of computer users who want results.

The "nothing new" fear must be relaxed when we recognize that urban use of computer systems technology is new enough that it has not yet woven into the mainstream of computer technology. Even now, few universities have urban economics courses. So, learning is required for urban computer use - living is <u>not</u> that easy and something is new.

To make matters worse, the newness feature of urban computer usage must be coupled with the sometimes artistic, rather than an always scientific, approach to urban policy and impact studies needed for success.

## Cooperation of User/Provider

A further look at the new aspects of urban operations studies and the information systems provided to assist them is warranted. A feeling of ease for the urban worker both on the computer systems side and on the operations function side came from saying:

> Since this has all been done before, in an analogous way, by engineers, practical and pure scientists, and the like, all we must do is use their techniques on our problems. A pre-packaged road to success is ours.

This is a false security because the world pursued by the urban analyst and policy maker appears to have its own free will. Society and economics can change behavior very unexpectedly and destroy the validity of an approach previously successful for describing them. A computer systems group set up to service other scientific-like work will, on these fundamental grounds, not do well for urban studies.

Data from which to gather understanding of the urban world are so sparsely and infrequently available that the observed system can change many times between data samples. It is not possible to get an accurate picture of the observed system. The engineer can generate almost as much data he or his computer can handle and be the better for it. The urban technologist often cannot find any data on a topic of interest. The data processing function must be prepared to deal with this problem. Otherwise, a vast machine complex might be set up to handle small quantities of data.

Understanding the normal roles of information systems groups and their urban policy user counterparts can sort out other difficulties. The computer group usually provides programming but only at the common usage level. The user function does not usually program computers except for simple packaged analysis. The urban systems conceptualizer may be underutilized if he does program the machine. It is also inefficient for the conceptualizer to communicate his needs in sufficient detail to a classically orientated programmer for purposes of programming. In this framework, the urban operations unit and the information systems group can never work in maximum productive harmony.

To solve this user/provider conflict requires that computer systems groups possess the benefit of experience with the techniques and concepts of the urban

operations function. Usually, the operations function practitioner is well enough versed by formal training in computer programming techniques to see eye-to-eye with the computer systems man. But some myopia has prevented, on the whole, the reverse capability of the computer systems man from being qualified in the tools of the trade of the computer user.

## Conclusion (and Cures)

In summary, the problems and the cures facing the use of information systems groups in urban governance stem from recognizing

1 The newness of urban systems studies.
2 The "free will" nature of urban systems and the difficulty of coming to grasp with it analytically.
3 The different approaches needed to tackle urban problems rather than using existing methods.
4 The lack of data with which to build and verify analyses.
5 The lack of mutual understanding between the information systems specialist and the urban computer systems user specialist.

Could we resolve these problems by saying about information systems, "Who needs it anyway?" Not if the urban operations function wants to look at real world problems. However, the real world is so complex and changing that if the urban systems analyst reflected it all, the data processing capability would have difficulty functioning. Thus, it must be decided if the cost-benefit of the urban operations and information systems work is large enough.

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## Abstract

This paper discussed the evaluation, use, and direction of the data processing service by local government managers. First, the managers' evaluations of the impact of computers on the operations of their governments is explored, utilizing survey data from chief executives in United States city and county governments. Secondly, the manager's direct use of the automated information system in the activities of information input, conversion, and output is explored. Third, certain strategies are proposed through which the manager can better manage the data processing unit - that is, can control and direct the service for the enhancement of local government operations.

## Résumé

Le présent document porte sur l'évaluation, l'utilisation et la direction des services informatiques par les gestionnaires d'administrations locales. Il examine d'abord leur évaluation de l'incidence des ordinateurs sur les activités de leurs administrations, en se servant de données fournies lors d'une enquête par des administrateurs de villes et de comtés des États-Unis. Il traite ensuite de la manière dont les gestionnaires utilisent directement l'informatique pour l'entrée, la conversion et la sortie de données. Il propose enfin certaines stratégies qui permettraient au gestionnaire de mieux administrer le service informatique, c'est-à-dire de contrôler et de diriger ce service de manière à améliorer les activités de l'administration locale.

## Introduction

The management function is, for the local government top executives and for all managers, a process whose aim is to achieve organizational objectives through the direction of other people and things. From the many lists meant to characterize the activities of managers, let us take Gulick's classic POSDCORB as representative - the manager's work involves planning, organizing, staffing, directing, coordinating, reporting, and budgeting. It is obvious that quality information is an important resource in the effectiveness with which the manager accomplishes these tasks. In fact, it is reasonable to conceptualize the manager as an information-processing system, who spends over half his time moving information.[1]

Even in the most sophisticated local government data processing operations, information from the automated system is only one component of the information employed by the top managers. Moreover, most city and county governments in the United States have employed EDP primarily in the routine, operational functions and there are few applications which, either by design or even by accident, provide clearly management-oriented information. While computer promoters continue to dream of the powerful "Management Information System" (MIS) with its richly integrated data bases, experience has sobered most people. The creation and successful use of such systems is now viewed as extremely difficult, if not unattainable.[2]

## Management Perceptions About EDP

City and county government chief executives' evaluations of the general effectiveness of EDP for the operations of their governments can be distinguished from the executives' direct use of EDP. Over 90% believe that the computer is essential to local government operations and an even higher proportion think that computers will be more essential in the future.[3] As Table 1 reveals, most chief executives perceive favorable impacts of EDP on the operations of the government they manage, particularly increased speed and ease of performance. But most are unconvinced that computers have effected overall cost or staff reductions.

**Table 1** United States City and County Government Chief Executive Perceptions about EDP

| Question | Percentage Indicating | | | | |
|---|---|---|---|---|---|
| | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
| "For the most part, computers have clearly increased the speed and ease of performance of government operations where they have been applied." (N=565) | 23 | 60 | 13 | 4 | 0 |
| "For the most part, computers have not reduced the cost of government operations where they have been applied." (N=563) | 9 | 42 | 17 | 29 | 3 |
| "Computers usually enable a reduction in the staff necessary to perform a task." (N=564) | 4 | 28 | 25 | 39 | 5 |
| "In general, computers provide information which is helpful to me in making decisions." (N=562) | 28 | 59 | 6 | 6 | 0 |
| "Reports and other materials produced by the computer are too detailed for my use." (N=561) | 2 | 18 | 16 | 58 | 7 |
| "Much of the data gathered by this government in its daily operations is not collected or organized in ways that provide useful information about community conditions and government operations." (N=561) | 9 | 47 | 15 | 26 | 3 |

## Management and EDP Interface

While chief executives express generalized support for the use of computers in their local government, what can be said about the direct interface between these top managers (as information processing systems) and EDP? It seems useful to distinguish at least four aspects of this interface. The aspect that has received most attention in the literature is information input - providing the manager with information generated by EDP. Potentially, the automated system can generate a substantial amount of useful information about the current state of local government operations and about the socio-economic environment within which the government exists. Such information, normally in the form of reports and aggregated and summarized data, can enhance the government manager's ability to achieve the kinds of functions implied in POSDCORB. Table 1 shows that chief executives do believe that EDP has increased the useful information for their decision-making activities; but they also feel that there is much information gathered by their government which simply is not available to them in any usable form.

A second aspect of the manager-EDP interface is information conversion. The manager is not merely a data receptacle. The dynamism of the management function entails the conversion of information into ideas and directives. At least, the top manager applies his own insights and models of the world to the data and restructures the data in modes that are more useful for his purposes. In its most refined form, this aspect is the stuff of MIS dreams. Supermanager swivels to his on-line information system and interrogates the data by posing "what if..." questions involving the manipulation of a variety of more and less controllable factors in this government and environment. Some local government managers have begun to utilize these problem-solving and problem-finding techniques, such as forecasting the implications of various changes in the revenue and expenditure situation of the government or simulating the demand on public services created by different patterns of growth and decay.

The third aspect is information output. The effective manager must communicate his directives. Currently, the most advanced technologies used by most local government managers for information output are the telephone and the dictating machine. Although local government personnel are not faced with great geographic dispersion, much of the manager's internal information transmission is mediated. One does not have to be a technophile to imagine modes of EDP use that could make the

manager's outward communications more efficient, timely, and reliable. As automated (and especially on-line) systems saturate a local government, this managerial use of EDP is likely to be exploited.

The final aspect of the manager-EDP interface is of fundamental importance - the management of the automated information system. All managers more or less consciously organize their information environment by the selective use of reports, meetings, informal contacts, memoranda, and so on. But when local government managers consider the EDP system, most are intimidated by its technical nature and complexity. Thus they specify vague objectives for the system, help to decide upon the major hardware and organizational arrangements for EDP, and then delegate other decisions to specialists. The responses from EDP managers in Table 2 show that about two-thirds of local government chief executives are involved in major hardware decisions; but the top managers were said to provide a major input to the adoption of new applications in only 33% of the governments and they exercised control in establishing priorities in the design and development of new applications in only 18% of the governments.

**Table 2** Local Government Data Processing Managers' Perceptions about Control over EDP Decisions

| | **Percentage Indicating** | | | |
|---|---|---|---|---|
| | Chief Executive Official | Data Processing | User Department | Inter-Department Board |
| "Provide a major input into whether or not a new set of EDP applications will be adopted." (N=477) | 33 | 78 | 73 | 32 |
| "Has authority for setting priorities for the development of new applications." (choose one) (N=477) | 18 | 51 | 3 | 15 |
| "Must approve budget requests for new computer mainframes and systems." (N=477) | 65 | 60 | 6 | 13 |

### Value of EDP as Seen by Management Function

Benign neglect of EDP by top managers might be justifiable if the EDP environment were quite stable. In fact, most EDP environments are characterized by substantial instability. Of the local governments surveyed, over 50% have experienced a major change (change in hardware generation, in mainframe vendor, in data processing management, or in EDP location) during the last two years. Moreover, when chief executives evaluate the greatest current and future payoffs from computing, their aspirations presume major transformations in EDP operations (Table 3). While

**Table 3** Chief Executive Beliefs about the Greatest Value of Computers and Data Processing to Local Government*

| The Greatest Value of Computers To Local Government | Percentage Indicating of Greatest Value** | |
|---|---|---|
| | Current % | Future % |
| Clerical: printing, recordkeeping, accounting, etc. | 90 | 47 |
| Information retrieval: searching criminal histories, property records, or customer accounts, etc. | 72 | 51 |
| Analysis: summarizing and aiding the interpretation of large amounts of data, etc. | 45 | 63 |
| Pooling large amounts of data for use by several departments or agencies | 39 | 37 |
| Forecasting: predicting community growth, etc. | 9 | 46 |
| Computer decision making: using the computer to decide between alternative courses of action | 5 | 37 |

* Each executive was asked to indicate no more than three of the six uses which are currently of greatest value and no more than three uses where computing will be of greatest value in the future (N=556).

** Note that percentages down each column add to over 100% because respondent could indicate up to three categories.

most chief executives believe that the greatest current value of computers is in the more routine, "housekeeping" kinds of functions, many expect a shift in relative value to the most analytical and sophisticated uses. For example, compared to current value choices, selection for future value increases five-fold for forecasting and seven-fold for computer decision making. Thus the computer as problem-solver and problem-finder is also likely to be a problem-generator for those managing these transformations in the EDP environment.

## Conclusion

The essence of the management function is to make critical decisions about how best to arrange and utilize the resources of the organization. The top manager who abdicates responsibility for EDP decisions is culpable on two levels. In one sense, such a manager fails to control a potentially rich resource which might enhance his own performance in most aspects of the management function. At a broader level, only the manager can make decisions about EDP from the perspective of the organization-as-a-whole rather than from the perspective of particular subunits.

The manager should consider a variety of strategies which might direct and control data processing:[4]

(1) demythologize the EDP priesthood - require EDP to articulate its case in the <u>manager's</u> language, not in their own language of the technical occult;

(2) decide to make the key decisions oneself - by running an EDP Policy Board and by setting development priorities (for applications and staff as well as hardware) in a specific, multi-year plan;

(3) ask critical questions - in particular, ask "anything next?" rather than "what next?" and stress the value of "renew" as well as "new" in automation of activities;

(4) utilize a mixed charging policy - use a sensitive pricing mechanism to regulate the nature and level of use of computer resources by particular operating units;

(5) institute service contracts - oblige EDP and users to specify the types, quality, and timeliness of service from EDP in a written agreement, with charges to users and payment to EDP contingent upon the fulfillment of the agreement;

(6) decentralize programmers and analysts - break up EDP's monopoly of technical expertise by placing these personnel in the user chain of command and infusing

them with the user's perspective.

By employing these kinds of mechanisms, the most important MIS can be achieved - the Manager's Information System.

## Notes

1 Henry Minzberg, "The Myths of MIS," California Management Review, XV (Fall 1972), 92-97.

2 Representative arguments are: Minzberg op. cit.; John Dearden, "MIS is a Mirage," Harvard Business Review (January-February 1972).

3 The data here and throughout this paper are taken from one phase of the URBIS research project. These data are based on self-administered mail questionnaires sent to the chief executive, data processing head, and data processing installation(s) in each United States general purpose local government (all municipalities with a population greater than 50,000 and all counties with a population greater than 100,000). For a fuller discussion of the findings cited here, see Kenneth Kraemer, James Danziger, William Dutton and Sigfrid Pearson, "Chief Executives, Local Government, and Computers," Nation's Cities 13 (No. 10) (October 1975), 17-40.

4 A valuable discussion directed to the government manager about how to control EDP is Kenneth Kraemer and John Leslie King, "Information Systems, Power, and Executive Control in Local Government" (Irvine, CA: Public Policy Research Organization, 1975).

## Acknowledgements

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## Role of Data Processing as Seen by Management Function

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### Abstract

The type of service provided by the data processing and systems organizations tends to lack responsiveness and will in all probability change in the next five year period. There will be a significant effort to decentralize these units by extending computer access through terminals for even cities of 50,000 population. A further trend toward decentralization will be seen through the use of sophisticated terminal oriented retrieval languages which can be used effectively by non-technical users. Beyond the five year period, we will no doubt see a break up of the large centralized systems groups who will become permanent employees of the user departments.

### Résumé

Le genre de service fourni par les systèmes de traitement des données tend à manquer de flexibilité et changera, selon toute probabilité, au cours des cinq prochaines années. On fera un effort considérable pour décentraliser ces services en permettant, au moyen de terminaux, l'accès de l'informatique à des villes de 50 000 habitants. Une autre formule visant à la décentralisation sera l'utilisation de langages perfectionnés d'extraction des données, conçus pour que des utilisateurs non spécialisés puissent s'en servir avec efficacité. Après cette période de cinq ans, on verra sans aucun doute un morcellement des groupes importants de systèmes centralisés, qui deviendront des "employés" permanents des services utilisateurs.

## Introduction

Local governments have accumulated a considerable body of experience with the use of computers and it's appropriate to reflect on their impact on the people and the organization from a not often considered point of view. What does the user think of all this?

I suggest that in many cases, the user of data processing services feels very much like the user of another widespread recent development of automation. I speak of the hot coffee vending machine which, in many ways, is similar to the computer and certainly leaves a similar taste in the mouth. Like the computer, the results are very fast but seemingly not as good. How many of you best remember these machines for the time when the machine dispensed the coffee but not in the cup? I suggest the users of data processing services often remember similar occasions when all went well but for the wrong date on the cheques or the missing batch in the tax notices. Like the vending machines, your services are accepted but not loved.

## Centralization of Services as a Problem

Why is this and what can be done about it? I suggest that the cause of the problem rests in some combination of lost expectations, and mistrust, or even antagonism over the ever increasing trend toward centralization of services. For years these local government departments had been operating reasonably independently. Granted there were service departments within city hall to contend with but as a rule these were services to the staff, not departments (obviously accounting is an exception but it was generally quite innocous). Then one day the first systems expert arrived making many exciting promises about how much faster and better he could do the job. He also seemed to have an annoying tendency to want to find out how people did their jobs and show them better ways (he thought). From there and over the years he designed and redesigned, each time saying how things were improving, costing less, being done faster.

I am reminded of a certain city treasurer who, upon making his retirement speech and prior to accepting the key to the city (they are cheaper than gold watches), commented on the most significant change in the organization in all the many years

of his employ. It was the introduction of the computer and its high priests, the analysts. He said, "You know those fellows came along and showed us how to do things better and faster. I don't know about the better but on a good morning they can make more mistakes than we used to in a year." (Remember the coffee machine which kept the cup?) How often has the city manager said (jokingly?) to the manager of information systems, "Don't show me any more ways to save money - we can't afford them anymore." These are the attitudes of the people in the operational areas - the "users."

Perhaps another reason for this feeling can be attributed to centralization. Early attempts at automation resulted in using simple ledger machines. Then along came the famous tabulators - the 403, 402, 407. These were the thin edge of the wedge. The ledger machines still gave the operating manager control over his own area of responsibility. The tabulator began to take some of that control away. This erosion of control has gone so far now that with many of the batch oriented computer systems, the user doesn't even find out about the mistakes he made until days or weeks later - when all the data (how the user's work becomes impersonalized by that word) finally gets batched, punched and edited. By then he can hardly recognize it! This is bad enough, but what about when he wants to make a small change. The way the computer processes his work or, simpler yet, accepts only one more bit of information - heaven forbid!!

The first thing that happens is that he is visited by a systems analyst, (Don't users have enough problems without having to put up with analysts?), whose purpose is to interpret the user's request to make sure he really meant what he said. Then he is warned about all the work resulting from his apparently simple request and how all the project teams have just started big projects and won't be available for at least six months (the user translates this to twelve months). We wonder why the user gets frustrated? In the old days he would have made the request to his head clerk and it would have been done in a few days (or so his memory tells him it was). But enough of this - what to do about it.

### Some Solutions

It would seem that some answers are at hand. I don't propose that we go back to the old days of the automated ledger machines. (I, too, have a vested interest.)

Most manufacturers today are selling fairly inexpensive machines which have loads of memory and ample terminal support. Such machines can assist the data processing department with some of the problems to which I refer but I suggest that there is one more development of which we have just seen the beginning. I refer to the simplified general purpose retrieval languages. With these products, the user sees the computer (and the analysts) in a different light. All of a sudden the user is his own person (I was going to say "man".). Now he is starting to get some feeling of control again. He doesn't have to phone the DP Manager everytime he wants to have something which "isn't in the system." As he used to, he only has to ask his Clerk III and presto!

My experience with one such system was such that I am even prepared to suggest that these retrieval languages will have a significant effect on the way we design systems. The centralized DP staff will only be responsible for designing and programming the edits and file updates (and for that burgeoning monster, the "Data Base Administrator"). The user will have total control over the reporting phase of his work. He will get back his control but hopefully get the benefits, long promised, of the computer.

For those computer professionals who say that such systems are only available to the large cities in our country, I would ask them to look a little closer. They are, in fact, available now for very much smaller places than Toronto, Edmonton or Vancouver. Presently, one of my clients is installing an inexpensive machine ($6,000 per month). This client is a municipality which has a population of 50,000 living on 15,000 parcels of land. The machine they have ordered will have most of the data captured and reporting on terminals. All data will be stored in a "State of the Art" data base, and many reports will be handled by a general purpose retrieval language.

## Conclusion

Such systems (based on general purpose retrieval language) are, I believe, a step in the right direction. The next step will be decentralized data centres, each linked to the other for access to a distributed data base. For the most part, the raw machine power is now available. What we need are the file creation, edit and update software equivalent to the generalized easy to use retrieval software. Then I suspect the users will be much happier with the data processing organization. They will be

## Discussion of Track Session D - Role of Data Processing Function

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The sessions in Track D were primarily tutorial and the limited questioning was to ask for additional information: There was little debate, none heated. Debate centered around the notion of EDP as a "skill bureaucracy" put forth at the outset by Jim Danziger. This debate simmered and reached a peak only at the last session.

In the first session Jim Danziger postulated that research indicates that EDP personnel at all levels exhibited the attitudes of a "skill bureaucracy" wherein their relationship to clients is primarily oriented to:

1 preserve autonomy from outside control;
2 assure dominance over clients;
3 expand its domain.

This assessment is derived essentially from analysis of the view of EDP personnel and analysis of allocation of staff resources. In summary he says:

> The dominance in the EDP unit of the values of autonomy, expansion, subordination of clients, and internal professionalism would make certain common occurrences in local government EDP more understandable: automated applications which are technically refined but do not especially facilitate the user's functional activity; the dependence of top policymakers upon EDP for critical information with which to determine EDP development priorities; hardware with excessive capacity and sophistication relative to the EDP services provided; the continuing stream of decisions to automate new applications for which there are few well-defined benefits. In sum, this paper suggests that EDP, in viewing itself as a skill bureaucracy rather than as a staff with a skill, has a perspective of its own function that might not be particularly beneficial and responsive to the needs of the government organization it serves.

Bob Harper presented, in essence, a master plan for developing an efficient, effective EDP function within city government. With a very effective slide presentation

he offered four major points:

1 See the management task as managing resources, people, plan, dollars and INFORMATION;
2 Start with user-developed and user-justified data bases to develop a common data base;
3 Involve a user as a project leader when developing applications, and require that the assigned project leader be knowledgeable concerning the application and be in a position to speak for his department;
4 Keep up with the technology and hire top quality people.

The questioning brought out additional nuances of the Calgary technique and some points on client attitudes.

Joe Horton presented some functional relationships and mutual interactions between the EDP process and the planning process. For example, the broadening of the repertoire of the planning process analysis tools, separate planning functions using the same data base, shortening analysis time. Planning is seen as forcing use of DP upward in the corporate hierarchy, and creating a need for canned programs and general purpose software. Joe covered factors seen as having effects on the speed of EDP assimilation in planning, and positive and negative factors on EDP use.

Gerry Hawkins gave an historical summary of the planning to date for a common municipal information system network for the six major community clusters in New Brunswick. This project grew out of requests for support from communities to the Provincial Municipal Affairs Department.

The project team evolved to include municipal officials supported by municipal affairs, and the provincial EDP director. The project has defined the scope of individual needs and is now ready to pursue a feasibility study. (Due to lack of funding ($70,000) the project is in abeyance.) Support might be forthcoming and the critical issue is whether the municipalities can or will wait out the time gap.

In the third session, Peter Meier laid down a number of laws he has come to respect out of his experience both in EDP and Operations and Method environments:

Diminishing returns 80% of the resources are required for the last 20% of the job;

Murphy's Law If changes can't go wrong they will;

Change Law  Changes don't work;

Bearded Law  Don't equate a programmer's beard with competence;

Critical Mass  At a certain size any project blows up;

Five Year Rule  Any decision lives five years.

Peter asked that the computer technology be demystified - consider the normal acceptance of the telephone system. He further suggested that most EDP use is of an operational nature and that developmental information for tactical use is limited and for strategic use even more so.

Bob Rayzak engaged the question of computer systems use as a tool for the student of the complex urban phenomena and had some cautions:

1 There is really nothing new in the 40-year history of urban systems;

2 That use of computers to discover policy (or policy formulation on demand) is not possible;

3 That engineering techniques are not sufficient for urban analysis.

He briefly gave his definition of the respective roles of the computer group and the analyst and pointed out areas of disjunction.

In addition to what was said during the Track Session, some items were left unsaid. We would like to set forth a few of them to complete our Rapporteurs' Report.

Information, as it was pointed out in one of the papers, can be used at operational, tactical, and strategic levels. Most of the reported applications were at the elementary level satisfying only EDP services. However, information technology coupled with appropriate methodologies,[1, 2] general system theories,[3] cybernetics,[4] simulation,[5] and gaming[6] may lead to managerial services by using information at tactical and strategic levels. Cybernetics deals with the study of systems of arbitrary character capable of receiving, storing, and processing information and utilizing it for purposes of communication and control and therefore, can bring appropriate perspective in conceiving urban systems.

We, as humans have to find solutions, if any, to our societal problems. We can find these solutions if we can realize the existence and scope of our problems, if we want to find feasible and mutually acceptable solutions, if we are ready to compromise between short and long term goals, and if we are able to meet the challenge of defining where we would like to be in the future.

Computers are among the most important tools we can use for this purpose. However, better utilization of information technology depends on comprehension

of abilities of computers by decision makers and technicians preparing these decisions.

In one of the papers, a descriptive picture was given to summarize how the computers are used in urban governance in the USA. However, what is needed, and what is also much more challenging, is setting up normative views on how they should be used.

In the same study, only the negative aspects of software technology are underlined as "skilled bureaucracy." One could and should point out the recent developments in advanced programming techniques such as flexible, defensive, modular, and structured programming, which are available for better program design and implementation.

## Notes


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# Feedback Session Observations and Chairman's Assessment

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## Introduction

Throughout the Symposium, but particularly during the wrap-up sessions, a number of participants offered comments and criticisms on what topics should have been covered but were not, missing constituencies, shortcomings of presentations, etc. On the other hand, there was also the occasional expression of a kind word. The Rapporteurs' Reports pick up on a number of these, but a few items merit special mention as feedback session observations, and as assessments of the Symposium by its Chairman. So as to be consistent with the operating directive that papers be brief, this commentary will similarly be held in check.

## Observations

A number of items presented themselves during the Symposium, and in the papers of the Proceedings. The following appear to be of major concern:

1 Citizens and persons elected to political office were conspicuous by their respective absences. The absence of political officers, if it is in fact important, is serious cause for worry since invitations to municipal, regional, and provincial governments were sent directly to the chief elected officers (mayors, premiers, senior council officer, etc.). That they chose to send other representatives is beyond the power of the Symposium organizer. Hopefully these representatives will initiate efforts within their own institutions to involve their elected officials in symposia and conferences of this type.

With regard to the citizen involvement factor, we are all citizens in the final analysis. It was observed on a number of occasions, however, that universities should play a much larger role in helping students-cum-citizens attain a much better appreciation of information technology/urban governance relationships. This concern is based on the notion that unless changes occur, the citizen will be on the outside looking in at a technocratic elite to which he/she cannot relate. Clearly, the

university route is just one avenue to be explored in terms of ensuring that the citizen is not alienated from the means and processes of urban governance, but it is a most likely candidate.

2 Training in this field is required by all of the functions, that is, management, planning, and operations. It was frequently observed that the universities have not performed well, if at all, in equipping persons in management, planning, and operations to deal with information technology. On the other hand, it was observed, there was considerable room for improvement on the part of the hardware and software people (information technologists) in terms of understanding and relating to the needs of the users of the technology. Proposals to the effect that universities and operating agencies (municipal governments, private sector, etc.) should join forces in setting up training programs, with senior governments' support via grants or other support mechanisms, were frequently brought forward.

3 There is not in place, in Canada, a formalized focal point or medium which facilitates exchanges of people, ideas, programs (software and otherwise), documents, etc.in the area of information technology and urban governance. It was noted that the Urban and Regional Information Systems Association (URISA), with a Canadian membership of 10 to 15 %, is the only useful mechanism currently available to Canadians in this field. Alternatives proposed included MSUA sponsoring a symposium of this type every several years, a professional organization being set in place, a drive for an expanded Canadian presence with URISA, and creation of a centre for assembling and disseminating literature in this field of activity.

4 Too few municipalities with populations in the range of 50,000 to 200,000 can benefit in the short run by accomplishments to date of the more technologically sophisticated federal, provincial, regional, and municipal governments. The argument advanced was that sophisticated technology, "exotic" applications, and necessity of having skilled staff to operate the capability, ruled out off-the-shelf adoption by these institutions. It was proposed, therefore, that a national program be instituted to support information technology evolution in these communities.

5 It is beyond the capability of most institutions to carry out R&D projects of an innovative nature, while simultaneously meeting day-to-day institutional needs, without some pooling of resources and expertise. By way of illustration, few (if any) institutions have excess overhead in terms of funds or person resources to carry out needed, detailed cost-benefit or cost-effectiveness studies, conduct

tests for new applications, investigate new or different programming languages, prepare documentation for use by other institutions, etc., without outside help. As might be anticipated, municipal and regional governments look to the provincial and federal governments for assistance, and the provinces look to the federal government first for financial support, second for the provision of expertise, and third, for documentation on how to do it. While the private sector and the universities can and do provide some relief in terms of expertise and learning/training materials and approaches, demand is seen to be far in excess of supply.

6 It would be presumptuous to believe that we have taken anything more than a step in the right direction through the Symposium. This comment bears most closely upon the track sessions, where we have just begun to openly and candidly discuss perspectives about which functions should do what, why, and how. It would, most likely, be appropriate to consider the Track Session papers as the first round of a modified Delphi exercise, and to use them as basis for a second round of perspectives on function responsibilities (management, planning, operations, and data processing/ organization and methods/management systems as a special operations component).

7 The topics chosen for discussion in the applications session (Plenary Session B - Selected Applications) are integral to all municipal, regional, and provincial governments. Further, the federal government also has more than a passing interest in financial, land/property and legislation processing information systems. While subsequent symposia in the area of information technology and urban governance should expand to consider other applications (e.g., social services, housing, transportation, engineering, etc.), they should continue exploring the three applications discussed during this Symposium. The argument here is that we tend to flit from topic to topic, as if they were unique events without a thematic component. For better or for worse, then, the present papers should serve as building blocks to be modified, and not as isolated contributions to a disorganized body of dialogue.

The preceding observations are a personal short list of key messages which participants seemed to be attempting to impart to each other, and to institutions through their representatives at the Symposium. The authors' papers and the rapporteurs' reports underline some of my comments, and point out a number of others as well.

## Assessment

Based on the facts of 1) having virtually all of the presentations turned in as papers for the Proceedings, 2) receiving the papers under far less than ideal circumstances, and 3) attaining a Symposium membership covering all functional areas, and representing seven provinces, a number of federal departments, municipal governments, universities and private firms, it appears that the idea of holding the Symposium was a good one. The true test of its utility, and of the Proceedings, will reside in downstream impacts:

- Will the Symposium per se serve to alert responsible officials to the prospect that information technology may be a key factor in the improved delivery of goods and services at the local levels by local and non-local institutions?
- Will the universities perceive that they have an expanded role to play in this area, and will they absorb the advice offered in these pages before launching their programs?
- Will institutions in their varying stages of development look to the lessons learned as depicted on these pages before developing or implementing an activity or plan of action?
- Will the Proceedings provide guidance and serve as a basis for structured argument and logical actions in the evolution of information technology in urban governance?

Those and similar challenges posed throughout the Proceedings reinforce the point that we are far from being home free in the area of information technology and urban governance. The present Symposium offers some answers, some proposals as to preferred avenues to pursue, and a lot of caveats and questions. There is the need for sharper questions, better papers, improved communications, and so on,all of which went without saying before the Symposium. It is reassuring, however, that we can surely close on the note that we have established, firmly, that the game is indeed worth the candle, and that it merits our continuing best effort.

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